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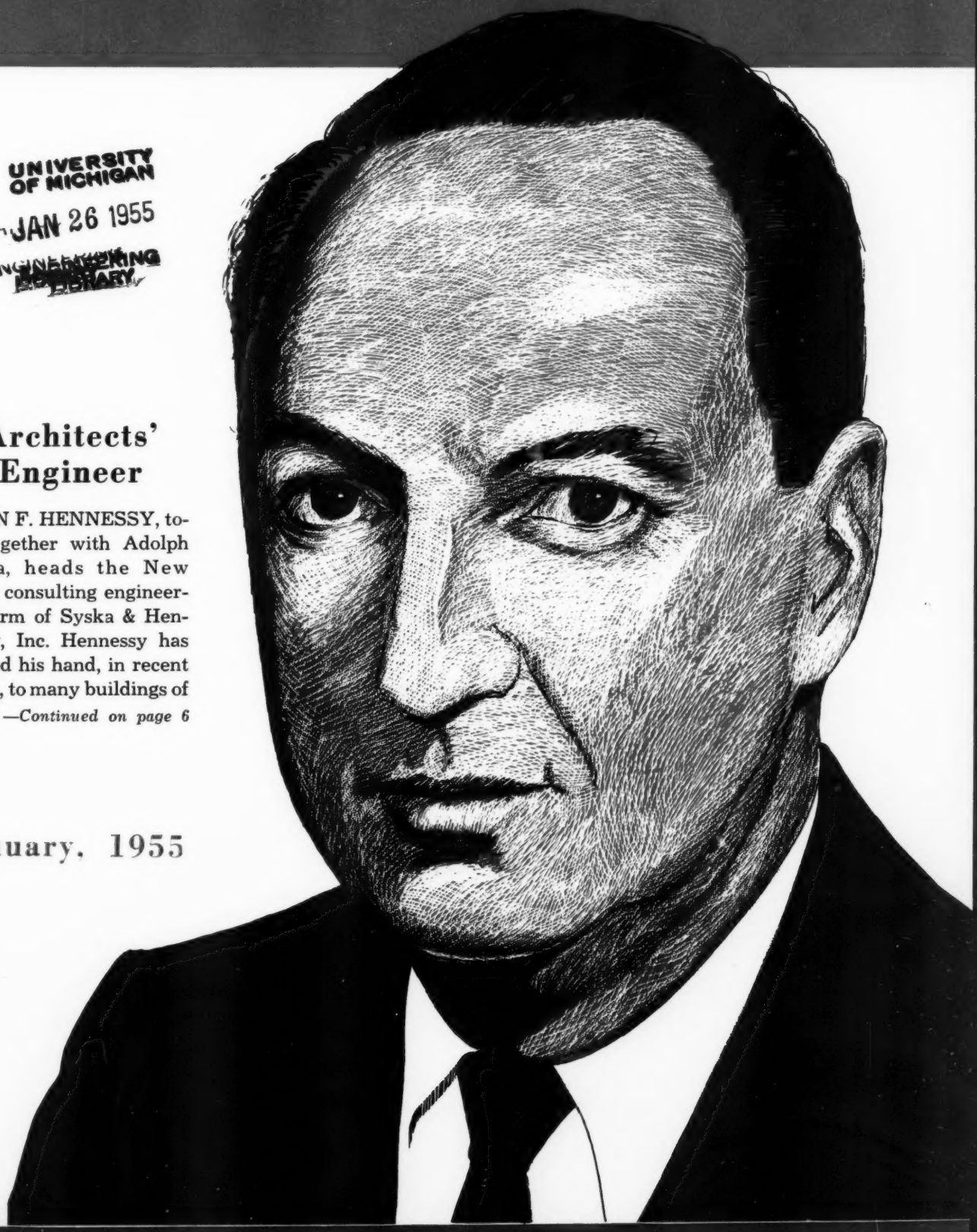

Architects' Engineer

JOHN F. HENNESSY, together with Adolph Syska, heads the New York consulting engineering firm of Syska & Hennessy, Inc. Hennessy has turned his hand, in recent years, to many buildings of

—Continued on page 6

January, 1955

The Consulting Engineer's Professional Magazine

EXCESS AIR

Prevent heat loss up the stack. Too much or too little excess air means big money in today's boiler plant. It's important to *know* and *control* excess air exactly—regardless of load or fuel changes.

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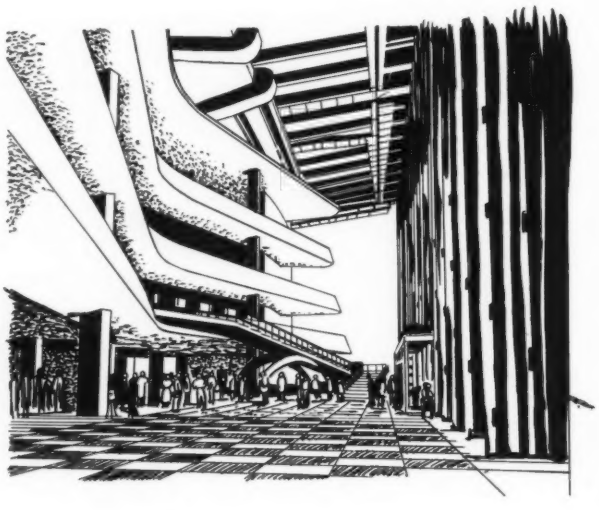
Architects' Engineer

—Continued from front cover

advanced architectural design. If you would ask whether he finds need of any particular talents to cope with the peculiar problems of modern, contemporary architecture, he would make modest reference to a need for extraordinary ingenuity to effectively deal with the many unique problems that these new architectural concepts present. For example, the extensive use of glass in contemporary building design frequently presents problems that call for completely original mechanical design.



When Syska & Hennessy was organized some twenty-seven years, and more than three hundred complicated jobs ago, there were not more than five or six engineering firms in New York whose work was geared to the specific needs of architects. Today, there are some thirty to forty. Hennessy says, "This is partly due to the increasing complexity of construction and partly because of the multitude of new products being developed that require a lot of personal research and study."

He illustrates his point by referring to the problem met in designing the air conditioning system for the General Assembly Building of the United Nations. (Hennessy's firm engineered the entire U.N. job.) To adequately cool the very high-ceilinged room in the Main Hall of this building, it was necessary to design special air nozzles that would not disturb the architectural concept.

The firm met with another puzzler in designing air conditioning outlets for the new glass-facaded Manufacturers Trust Company Building on New York's Fifth Avenue. The problem here was to locate air conditioning outlets—within the limitations imposed by the unusual architectural design — close to the glass exterior to overcome the high heat gain.

Specialist For 30 Years

Hennessy speaks as a specialist who has worked the engineering aspects of building construction for a period of 30 years. Ever since he and Syska left the office of Clyde R. Place in 1928, to form their own firm, they have found more than enough to occupy themselves in building projects. (Syska had gone with Place right after graduating from MIT back in 1924.)

Hennessy's firm is composed of top flight designers skilled in a variety of fields allied with building construction. This includes heating, air conditioning, lighting, sanitation, elevators, and other mechanical and electrical work. The company has never turned to heavy engineering construction projects such as roads or bridges.

Hennessy views the particular branch of engineering that he has chosen to follow as presenting ever-increasing opportunities for young engineers. He feels that students now in training should consider choosing one of the several engineering specialties within the field of building design. He thinks, too, young engineers should develop greater "economic consciousness" and give some thought to community work and some thought to public service.

He sets the example. He is active in committee work with the New York Society of Professional Engineers. Among other professional organizations, Hennessy supports the American Institute of Consulting Engineers.

He is a solid believer in the need for licensing of all officers of engineering corporations. Hennessy recognizes that talents and property must be regulated whenever they are applied in a way that affects the welfare of society. He also feels that the engineer has a greater obligation to society as a citizen than the mere practice of his licensed profession. For his own part, he claims never to have accepted any task in public affairs or charitable work without himself gaining something valuable from it.

Serves The Military

He signed up with the Air Force in World War II. He was assigned to the Rubber Reserve Program and the Petroleum Administration for War, heading up their construction programs. Since the war, Hennessy has done much work for the Secretary of Defense in an advisory capacity. His firm includes among its current projects the new Air Force Academy at Colorado Springs, Colorado.

In his spare time, Hennessy indulges in gardening. Four years ago he acquired a commercial greenhouse at Remsenburg, Long Island, as a means of finding an after-hours pursuit as far removed as possible from engineering. But he found that even this project involves problems of temperature and humidity control. ▲▲

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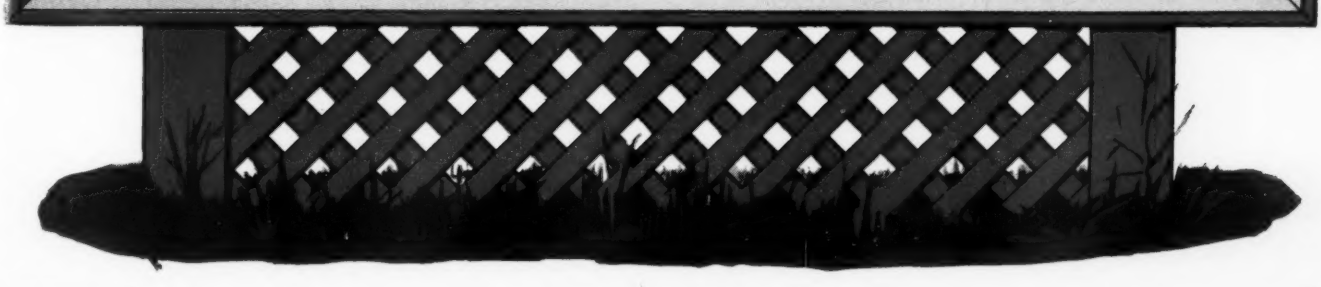


READERS' COMMENT

Genius Vindicated?

Sir:

It is with great interest that I read your magazine "CONSULTING ENGINEER," and I was particularly interested in your "Genius at Work—1890" article in the December issue (pg 72).

The subtle sarcasm as to the genius' practical sense makes me bring the short article "Building Set on Turntable Will Rotate to Follow Sun" in the *Engineering News-Record* of December 23, 1954, pg 20, to your attention. It just took 64 years to recognize the genius. The article refers to a six-story office building that will rotate on a turntable for maximum utilization of the sun's heat and light, and is being designed in Denver by architect Jared B. Morse.

George E. Schumann
Chief Consulting Design Engineer
Kaiser Engineers
Div. of Henry J. Kaiser Co.

More on "Employment Offices"

Sir:

I have never seen a more clear and forthright exposure of the abusive practices to which great numbers of engineers and designers have been submitted than the [letter] by Mr. Barraza "Employment Offices," in your Readers' Comment, pg 10, December, 1954.

Having been myself, at the beginning of my career and right after graduation, a victim of such loathsome practice for nearly three years, I know only too well what Mr. Barraza has exposed. I cannot understand how such practice continues with full impunity and that no engineering group or society has taken note of it. In fact, such activity by employment men posing as a bona fide engineering company is far more prevalent than it is generally known. I am aware of the existence of no less than 50 such concerns in the metropolitan area with a hiring capacity of about 100 to 200 men each. Thus they control several thousands of engineers and designers to be marketed wholesale to the best bidder among the largest manufacturing companies, year after year.

By personal experience I know that the hapless man, many times hired sight unseen through help wanted notices and then leased out, acts with a sense of not belonging anywhere and that ultimately his output will only be a pittance. The strange part is that important companies are fully aware of the situation and prefer to act in connivance with the operators of these men-leasing-out concerns rather than to extend improved conditions and pay those working directly for them. At the same time owners of these concerns, who know of no ethics or principles, are permitted to become rich without producing useful work or assuming any responsibility for the men they lease out.

I applied many times for work at one of the largest companies but the answer was "no vacancy." Then I was hired by one of the lease-out concerns at a price higher than the large company would pay and in a matter of hours I was assigned to the very plant where employment had been denied to me.

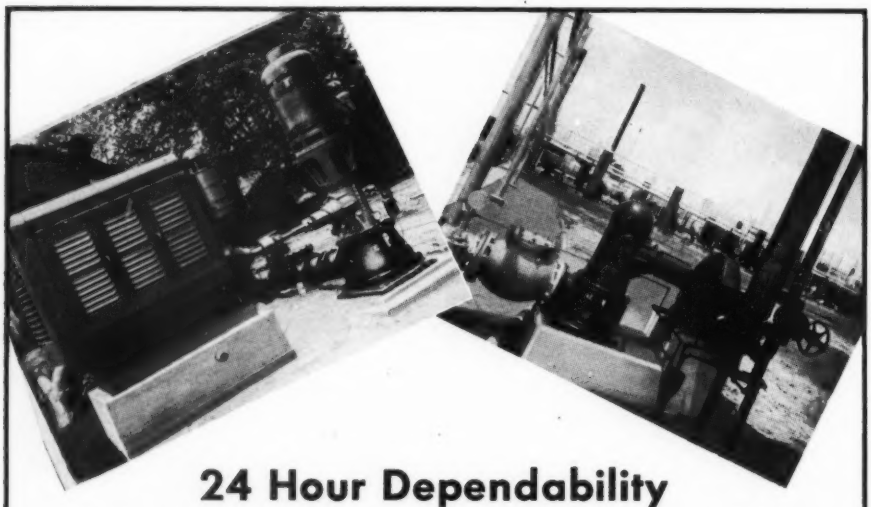
Al Seskin
Industrial Designer
Long Island, N.Y.

He Should Know

Sir:

I have been interested in reading the article "How to Register in Other States" by Mr. John D. Constance in the November issue of CONSULTING ENGINEER.

I think that Mr. Constance's general discussion is excellent but want to call your attention to the rather



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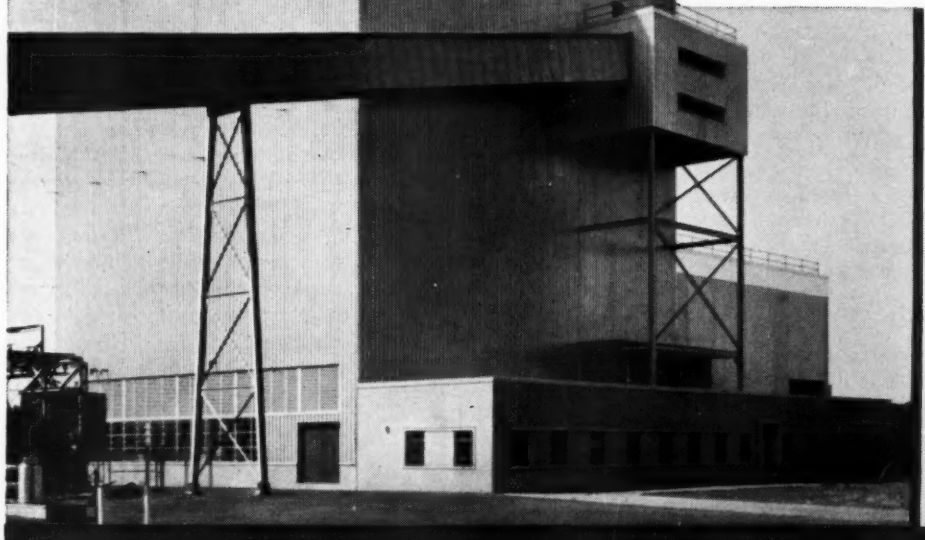

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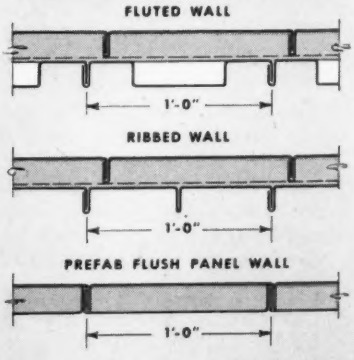

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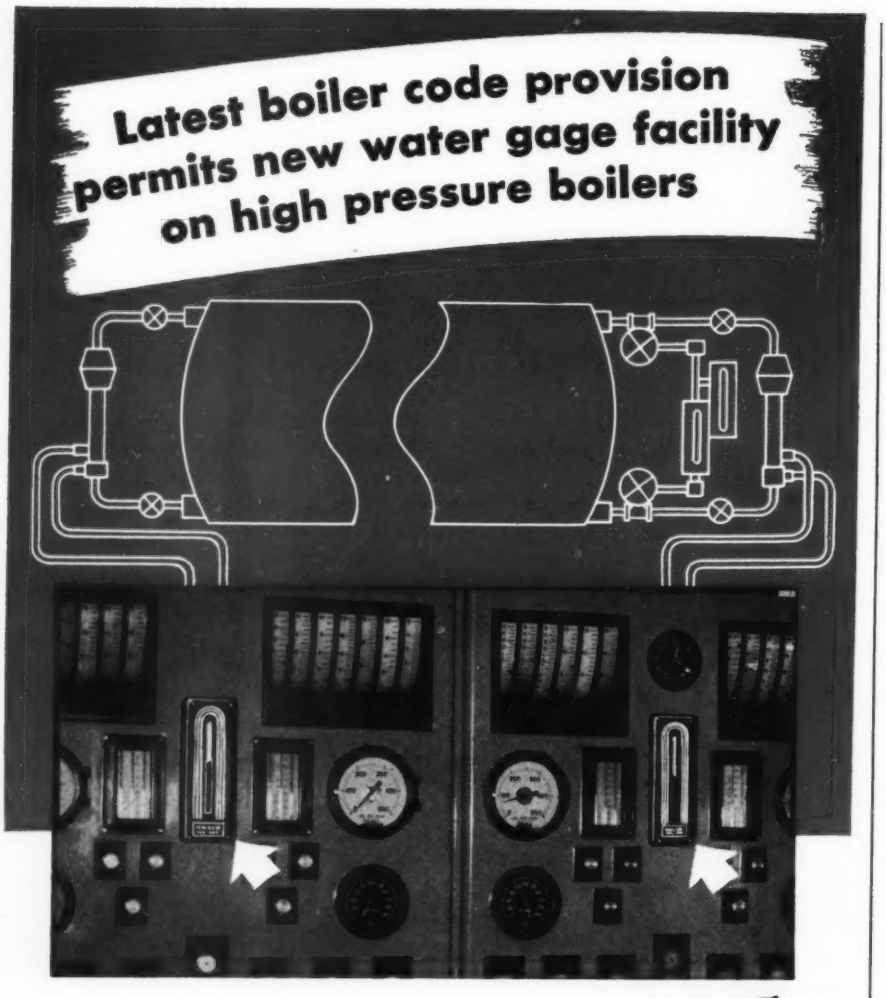

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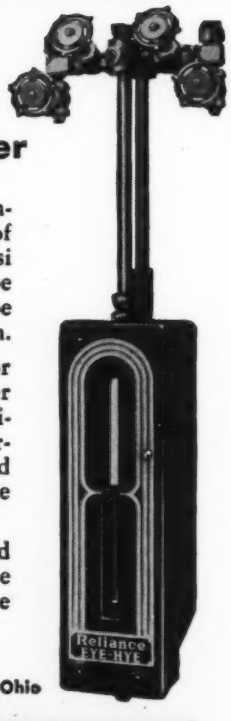

Two independent remote level indicators of the compensated manometric type may now be used instead of one of two gage glasses required on pressures 900 psi and over. You still must have one conventional type gage, maintained in serviceable condition, but it may be shut off while both remote indicators are in operation.

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For full details of the new code interpretation read Case No. 1155. For information about Reliance EYE-HYE, call your Reliance representative or write for Bulletin CO.

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serious error in the summary on pages 58 and 59.

The Colorado requirements mentioned by Mr. Constance were applicable prior to some years ago. In 1951, the Colorado Registration Law was changed; but in a suit which was sent to the Colorado Supreme Court, this law was declared unconstitutional for various reasons. In 1952, the present Law was passed and is now in effect. As you will note on page ten of the enclosed reprint, to be registered in Colorado without an examination an applicant must be at least thirty-five years of age and must have had, including education, a total of twelve years of experience.

C. L. Eckel
Dean, University of Colorado
Vice Chairman
Colorado State Board
of Registration for
Professional Engineers

Hot Subjects

I find your magazine very instructive and circulate it regularly among the members of my staff. I was particularly interested in Mr. Owen S. Lieberg's article "High Temperature Water," and John D. Constance's article "How to Register Your Engineers," appearing in the September 1954 issue.

This firm has been retained by the Bureau of Yards and Docks, Navy Department, to prepare standard plans and specifications for central heating plants. We are investigating the various types of high temperature water installations . . . However, one phase of high temperature water systems is not so well covered and that is the use of conventional steam generating units for this service where the steam drum itself is included as part of the expansion system. An article along these lines would be very instructive to engineers who are considering changing existing installations from steam to high temperature water, and who prefer this system over that recommended by Lieberg and Geiringer.

As a member of the District of Columbia Board of Registration for Professional Engineers, I was very favorably impressed with Mr. Constance's article, particularly the second paragraph concerning "advocating that registration should be required not only of the principals but also of all engineering employees." I would like to see this phase of registration amplified.

C. Warren Bogan
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You can use the high-temperature strength of "T-1" Steel to increase the service life of steel mill equipment and rotating machines. You can use its amazing sub-zero toughness and resistance to abuse in excavating and mining equipment that must operate outdoors in the most severe weather. In fact, with "T-1" Steel you can increase the strength, dependability, and safety of heavy duty equipment for use at *any* atmospheric temperature. Send the coupon for complete information.

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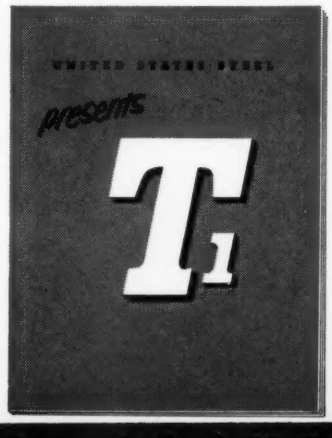

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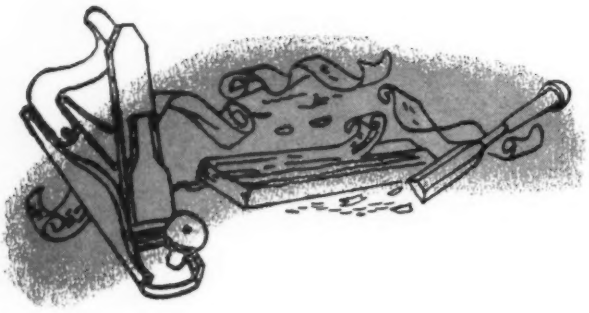

SCRAPS & SHAVINGS

IMPORTANT OPPORTUNITIES await American consulting engineers across the oceans. More and more consultants are discovering that there are new worlds to be conquered in foreign lands. Indeed, the New World in the sense of history is becoming the Old World in the sense of technology—the world from which new trailblazers are putting out to conquer, technological though that conquest may be.

This is not to say that there is a scarcity of work for consulting engineers at home. They know that their American markets can sustain them for time indefinite. And the "Survey of the Profession" published in this issue bears out that feeling.

Why, then, are so many consultants taking on foreign jobs when there is enough work at home? Obviously, the foreign jobs pay. Equally true, foreign work brings with it a measure of satisfaction that is not to be found in work "around the house." We suppose that it might be hard to believe—but we think it nonetheless true—that there are still those who feel a trailblazer's joy in contemplation of a foreign job fulfilled.

For our part, we can say that we have observed a few puffed-out chests, filled with a little of the same sort of pride that swelled the chests of a Columbus or a Magellan. Nonsense? We think not. We don't think that the nature of Man, The Conqueror, has changed to the extent that he can no longer feel pride in conquest. The story is told of the young lad who stood with his father on the shores of the Pacific some 55 years ago. When the father bemoaned that no frontiers were left for his son to conquer, the lad replied that he could still find frontiers to conquer —straight up. Consulting engineers, too, are finding their frontiers by seeking in new directions—even directions that carry them back to worlds long thought fully "discovered."

True, it is no longer the conquest of the earth's surface as such that occupies us here. But it is no less a conquest of Nature for the consulting engineer to bring some measure of civilization to places that have not yet enjoyed it—or whose vestiges of it have all but evaporated. Today's conquest is no longer in terms of discovery, but in terms of technological development. This reduces to a simple problem in semantics, for do we not discover as we develop?

You may shift a bit in your chair with the thought that this is great—for the other guy. Maybe so. But you might be surprised how soon the "other guy" becomes "you." Too many men whose sights had never focused beyond the edge of their desk are now doing engineering work in far-off places.

Of course, great rewards command great effort. Engineering a foreign job has headaches all its own: training of local labor, adaptation to new units of measure, incorporation of foreign materials and equipment in design, maintenance of key American personnel (perhaps with families) overseas for an extended period of time, exchange of funds, and political implications. Yet we feel that these obstacles can be conquered in no less a grand manner than have the obstacles that beset conquerors of other frontiers in other generations.

Many American consulting engineers learned that it is possible to live with such problems of foreign work when they took on some of the projects sponsored by the American military since 1940. Between wars, our government has sponsored technical projects of all kinds—projects that carry American engineers all over the globe. But it is our government's announced policy to reduce such dispensation of engineering. Many foreign governments have already retained American engineering talent with their own funds, and under their own initiative. India, Burma, Indo-China and other countries in that neighborhood are already paying handsomely for American engineering talent. European and African jobs are coming to increasing numbers of American consultants.

Our own appraisal of the foreign market for consulting engineers motivates our editorial policy to the extent that we have already established an editor in Zurich, Switzerland to cover the European front. We have arranged for material from correspondents in Singapore and South Africa. We think that you might well take a good look at those important opportunities across the oceans—by way of our pages and perhaps by way of your own initiative. ▲▲

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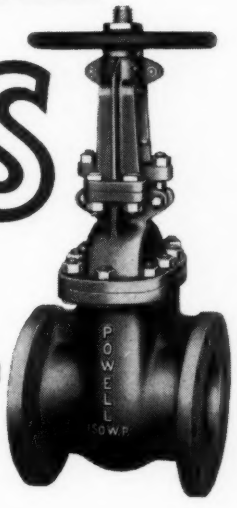

FIG. 2453-G Stainless Steel O.S.&Y. Gate Valve for 150 Pounds W.P.

FIG. 1793—Iron Body Bronze Mounted Gate Valve for 125 Pounds W.P.

FIG. 19003—900-Pound Pressure Seal Gate Valve.

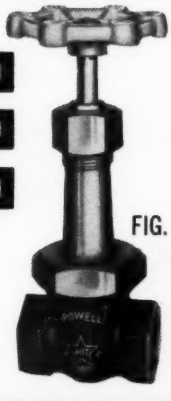

FIG. 375—Bronze "White Star" Gate Valve for 200 Pounds W.S.P.

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

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the Legal Aspect

MELVIN NORD
Consultant in Legal and Technical Problems
Registered Professional Engineer
Patent Attorney

. . . patents, copyrights, trademarks

PATENTS, COPYRIGHTS, and trademarks may be regarded as varieties of "intellectual property" that are protected by specific statute as well as by the doctrines of "common-law copyright," unfair competition, and unfair trade practice. According to the doctrine of "common-law copyright," an intellectual conception is the property of the person who conceived it—regardless of its novelty, artistic value, or literary merit. If the idea is revealed in confidence to someone, it remains the "property" of the one who conceived it. If the idea is stolen or "pirated" by one who learned of it confidentially or obtained it wrongfully, he is liable to the "owner" of the idea for damages. He may be enjoined from divulging it further or he may be enjoined otherwise using it.

While this doctrine is a good one, as far as it goes, it suffers from a number of practical drawbacks. The biggest hurdle is proving piracy—that is, proving that a defendant obtained an idea from a plaintiff. Naturally, "pirates" are careful to avoid creating any such proof. It is not sufficient to show the plaintiff conceived the idea, and that it was later used by the defendant. The defendant may have conceived it himself or obtained it elsewhere. Only a patent obtained under statutory law can protect the "first" inventor.

Enters Public Domain

The second difficulty with the doctrine of "common-law copyright" is that if the idea is revealed to the public (through use or direct disclosure), it is said to be "dedicated to the public." It thereby enters the public domain and is no longer the property of the originator. This makes it impossible to exploit an idea fully without losing control over it unless prior arrangements are made to obtain a patent, copyright, or trademark.

The "common-law copyright" doctrine is applicable to all types of "intellectual property," regardless of whether or not they are capable of protection under the patent, copyright, or trademark statutes. For example, slogans or titles are capable of protection by the doctrine of "common-law copyright," but are afforded no statutory protection.

An invention is, of course, one type of intellectual conception. It is a new and useful idea that has been reduced to practice (actually, or constructively through filing a patent application). When the Federal government grants a patent, it gives the inventor the exclusive right to make, use, and sell his invention for a period of 17 years. In return for this period of protection, the invention is immediately made known to the public by the very issuance of the patent. In the absence of a patent, making the invention known would amount to a dedication to the public. After the patent's 17-year period, the invention enters the public domain.

Thus, while patent law is statutory, it has roots in common law. Inventions not patented or patentable may nevertheless be protected against stealing by the "common-law copyright" doctrine. The same is true of inventions for which patents have been applied but not yet issued.

Copyright

A copyright is a statutory right that gives an author, for a limited time, the exclusive right to reproduce the expression of "written" works—such as books, magazines, catalogs, maps, photographs, drawings, musical compositions, and so forth. The *ideas* are not protected but only the *expression* of the ideas. For example, the ideas expressed in a book may be used at will by the public, but the public is not entitled to copy the words and sentences to any substantial extent without permission.

The term of a copyright is 28 years, and it is renewable once for an additional term of 28 years. The status of statutory copyright is in some respects analogous to that of patents in that the intellectual property is capable of protection by common-law copyright. Disclosure to the public does not put the

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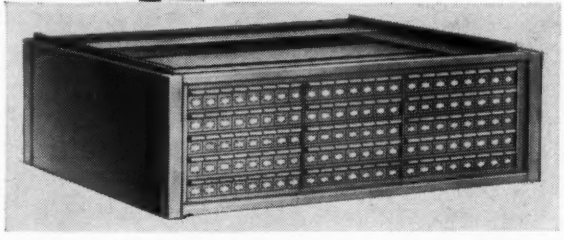

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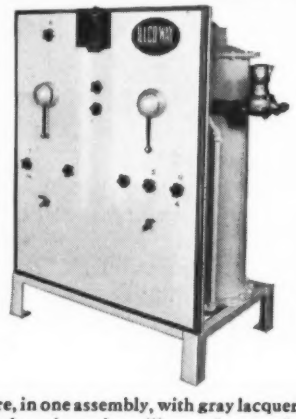

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work in the public domain until the 28 (or 56) years elapse.

The requirements for obtaining a copyright are entirely different from those involved in obtaining a patent. Obtaining a copyright is simplicity itself. One merely publishes or sells the work with a notice clearly marked on it stating that it is copyrighted. The owner, and in some cases the date, must also be shown. Following this, an application form is filed requesting a copyright, and two copies of the work are deposited in the Copyright Office. The Copyright Certificate is automatically issued *without* any fight by the Copyright Office. (In fact, the certificate is part of the original application to which a seal is later attached by the Copyright Office.)

Notice First

The most important fact about obtaining a copyright is that it is necessary to place the notice of copyright on the work *before* it is published, and before an application for copyright has been made. It is too late to do so after the work has been put on sale, for this amounts to dedication to the public. The copyright protection begins when the work is published or sold with the copyright notice attached, rather than when the formal application is made. This emphasizes the fact that what is protected by the statutory copyright is not a grant from the government so much as it is recognition of an established common-law property right.

A trademark differs very considerably from a patent or a copyright in principle—especially from a patent. But the procedure for obtaining it resembles the procedure for obtaining a patent.

A trademark is not an abstract property right in the sense of an intellectual conception. It is actually the right to continue to use a certain mark on certain goods in trade. If the mark is not used on the goods, mere registration of it in the Trademark Office has no legal effect.

The protection of trademarks is also of common-law origin, being primarily based on the doctrines of unfair competition and unfair trade practices. Palming off one's goods as the goods of another has always been illegal under the common law. If the one whose goods are thus being imitated brings suit, he can obtain damages or an injunction on the ground of unfair competition. Similarly, a member of the public may bring an action for an injunction if the public is being misled as to who the producer is; this is based on the historic doctrine of unfair trade practices.

Intention to Deceive

The Trademark Act provides a similar statutory remedy for infringement of a registered trademark. The advantage of such action is that it is not necessary to prove intention to deceive the public in order to obtain an injunction against the infringer.

Under certain circumstances, priority of adoption of a registered trademark can be made uncontestable. In order to accomplish this, the registrant files an affidavit stating that the trademark has been in use for five years, that it is still in use, and that there has been no final legal decision adverse to his claim of ownership of the mark. If he does this at the end of the fifth year of registration, his *priority* is uncontestable. If the affidavit claiming continued use is not filed by the end of the sixth year of registration, the Trademark Office can cancel registration for nonuse.

Claim Abandonment

Other defenses for retaining a trademark may be available to persons sued for infringement. They may claim abandonment of the mark by the original owner, that the trademark has become a common descriptive name (such as aspirin), or that the trademark registration was originally obtained fraudulently.

Trademarks differ from patents in that there is no requirement of

novelty. An abandoned trademark can be registered later by someone else, provided it would not tend to mislead the public. Furthermore, a registered trademark does not necessarily give any rights over the entire country. If the use of the mark has been confined to a well-defined territory, rights are not automatically obtained in other territories. That is one reason why a given product sometimes has different trademarked names in different areas where it is sold.

Obtaining a trademark is lengthy procedure, like obtaining a patent. The Patent Office makes every effort to show that someone else has already registered essentially the same trademark. The attorney makes every effort to show that his client's mark is really different. After a number of such arguments, the trademark is published in the Patent Gazette if it has chances of proving acceptable for registration. If anyone wishes to oppose the registration, he has 30 days after this printing in which to file a notice to that effect. A hearing is then held to determine the issue. ▲▲

Cℓ quotes - -

Here then is a major problem—our economy requires group effort to perform its increasingly complex tasks, it requires also individual genius and accomplishment if we are to go on to greater spiritual understanding and material well-being. The task of the administrator in government, in business, in science is to create group harmony, while at the same time encouraging high individual performance .... The group serves as a powerful stimulant of ideas and a profound judge of their merit, but it cannot produce the flash of inspiration on which success and progress depend.

Crawford H. Greenewalt
President
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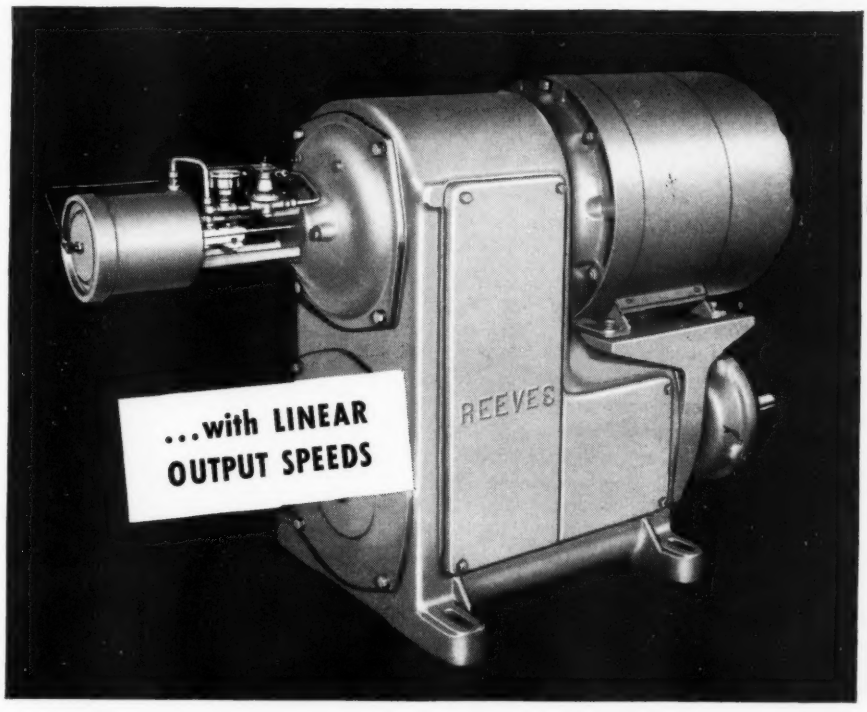

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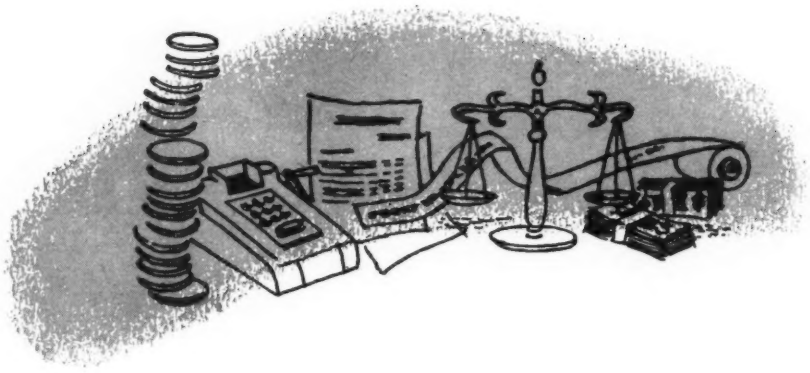
ECONOMIC NEWS NOTES



E. J. Mac Donald
INDUSTRIAL ECONOMIST

NECESSARY STATISTICS — Take pains in filling in the questionnaire you may have received from the Census Bureau — it will be an important contribution to a most important survey. To find out the size and nature of business growth in the boom since the end of World War II, the Census Bureau is collecting data on sales, employment, payrolls, costs, inventories, and credit operations from manufacturing, mining, and trade concerns.

COMPETITIVE NECESSITY — The American Institute of Management has estimated that air conditioning becomes a competitive necessity when 15% of the desirable office space available in a city has been air conditioned. Mr. D. C. Minard, president of The Trane Co., feels this is a conservative estimate. He holds that a single outstanding example of an air-conditioned building of reasonable size will put owners of competitive buildings in the same area under pressure to follow suit. He points out that new, big buildings are being equipped almost 100% with air conditioning.

PROGRESSIVE STEP — Boston is working up a project for replacing a 24-acre residential slum area with a business area designed for light industry. It is expected that the plan will be approved under the Federal Urban Redevelopment Law by February, and new construction should be under way by the fall of this year. This type of city rehabilitation appears highly desirable — taxable values are increased, the scarcity of new and advantageously located sites within the city is eased, and the new look sets a tone for the whole city.

PERSISTENCE PAYS — New England is getting the steel mill it has worked so hard for since the end of the War. The new mill, called the Northeastern Steel Corp., will produce hot rolled specialty steels for New England and eastern New York markets. The new company will acquire the existing steel strip plant of the Stanley Works, in Bridgeport, the capacity of which will be increased from its present 188,000 tons of ingot to 300,000 tons and diversified by converting some facilities to production of carbon and alloy bars. If industrial history is repeated, the operation of the new steel plant should stimulate additional metal-working industries in New England and thus expand the market for the output of the new mill.

SIGNS OF THE TIMES — Contract construction had the largest increase in number of new firms in operation in 1953 of all major industrial categories. According to data recently released by the Department of Commerce, the field of contract construction was increased by 14,000 firms in 1953 while the number of manufacturing firms declined by 5,000. Ordinarily, a heavy ingress of new firms in a given field is shortly followed by an increase in failures in that field as infant companies fall by the wayside. However, failures of firms in construction, as a percentage of total failures in all lines, were unchanged at 11.7% for the 1st 10 months of 1954 from the similar period of 1953. Failures of general building contractors declined slightly from 4.3% of all failures to 4.1%.

REAL NEED — After 3½ years of studying the need for grade and high school facilities, the National Citizens Commission has estimated that at least 950,000 new classrooms will be required within the next decade. The cost would be about $32 million. As a result of the projected increase of 12 million in population of school-age children by 1965, current annual outlays of $10 million on public and private schools should be increased by $5 to $10 million.

CONSTRUCTION POTENTIAL — A survey being made by the Census Bureau of state and local public works projects available for implementation is nearing completion. According to Gen. J. S. Bragdon, coordinator of public works planning for the Council of Economic Advisers, 6,000 to 8,000 projects will appear in the backlog.

GETTING OUT — In confirming the Administration's intention of minimizing Government competition with private industry, Budget Director Hughes has announced that all Federal government properties will be surveyed with the idea of disposing of land and buildings not found essential to Federal activities. He explained, "The objectives are the return of property to state and local tax rolls, from which it is now exempt, the elimination of high maintenance costs, and deposit of the cash proceeds in the Treasury."

WASTE DISPOSAL — If you have an interest in this subject, you might want a copy of the proceedings of the 1954 Southern Industrial Wastes Conference. The 200 pages are reported to cover the subject from problem to answer. $2.50 from Manufacturing Chemists Assoc., Washington 6, D.C.

THROUGH THE TRANSIT — Mr. T. S. Holden, vice chairman of F. W. Dodge Corp., forecasts that building construction of all types this year will be 5% greater than 1954 in physical volume and 6% greater in dollar volume .... Federal outlays of around $20 million will be made in fiscal 1955 for new construction and improvement of airports. These expenditures will be matched by local government outlays .... A 5-year, $269-million plan for public improvements has been approved by the Chicago Engineering Board of Review, $64 million of which is scheduled for this year .... A 5-year, $495-million construction plan has been recommended by California's Construction Planning Committee, with emphasis on additional schools, hospitals, and penitentaries. ▲▲

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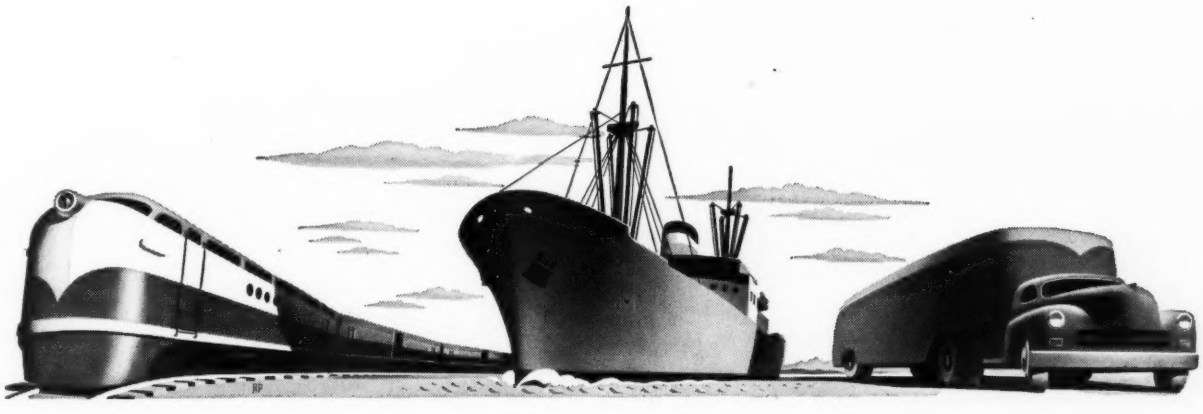

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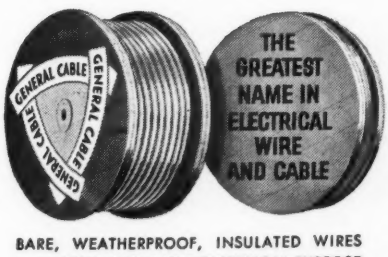

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ATOMS IN ACTION

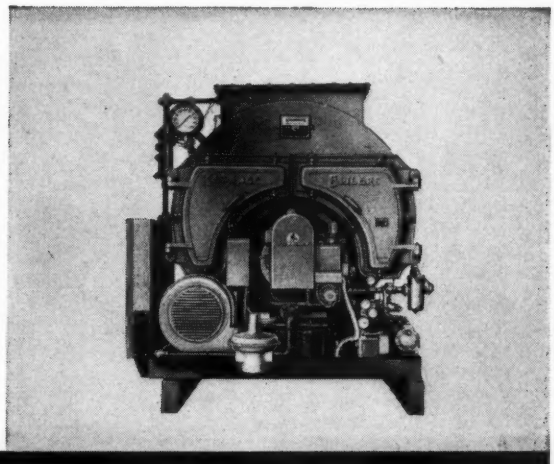
THE ARMY'S PACKAGE nuclear power plant will be designed and built by American Locomotive for $2,096,753. The contract was awarded to ALCO in competition with 17 other firms on the basis of price, excellence of design, and responsiveness to other contract terms.

MANY OTHER irons have been thrust into the nuclear fires lately. With $200,000 put on the barrelhead by Resources For the Future, Inc., RFF and the National Planning Association will run a comprehensive study of the opportunities for nonmilitary use of atomic energy. . . . Battelle Institute is investing $1,535,000 for the expansion of their present $2,000,000 nuclear energy research facilities. . . Martin Aircraft has formed a separate Nuclear Division with the intention of becoming a major supplier of portable nuclear power equipment for military, industrial, and commercial use . . . . Walker Cisler, president of Detroit Edison, has announced founding of the Fund for Peaceful Atomic Development, Inc., a private international program to develop peaceful uses of atomic energy at people-to-people, industry-to-industry, and science-to-science levels. . . . Kaiser Engineers has received the green light from the AEC for a one-year, $100,000 feasibility study of nuclear power reactors — the 18th such study authorized under the Industrial Participation Program. . . . Central Hudson Gas and Electric joined the Atomic Power Development Associates, a group of utilities studying, since 1950, generation of electric power from the atom and proposing a 100,000-kw experimental atomic generating station for somewhere in Michigan. . . . And Bozell and Jacobs, the first recognized advertising agency to organize a Nuclear Energy Information Division, adds Edward R. Trapnell to its staff to work in this division. Trapnell has been special assistant to the general manager of the AEC. He was in charge of planning and policy for liaison between AEC and other branches of the government.

CANADA'S ONTARIO Hydro Power Commission figures it could put an atomic power plant on the line three years after construction is started. The need is abated until 1958 due to the St. Lawrence Seaway power project, so they won't be starting now. In the meantime, the Canadians are keeping up with the development of Great Britain's Mark 1 plant, scheduled for startup in 1956.

NO DOUBTS exist at the AEC about having sufficient nuclear fuel for future power generation. The immediate need is to carry out the defense program. That uranium mining will be important in the future is assured — the timetable for further development of the industry is the only uncertain item. . . . General Electric feels that the growth in world population demands that a new source of low-cost energy be found by 1975. Atomic-electric power is the feasible answer seen — with gas, oil, and coal beginning to assume their ultimate roles as raw materials for a greatly expanded chemical industry in the not-too-distant future. . . . And another source assures us that use of all the world's economically recoverable uranium and thorium would supply adequate energy for 30 centuries at present consumption rates. ▲▲

3 winning combinations



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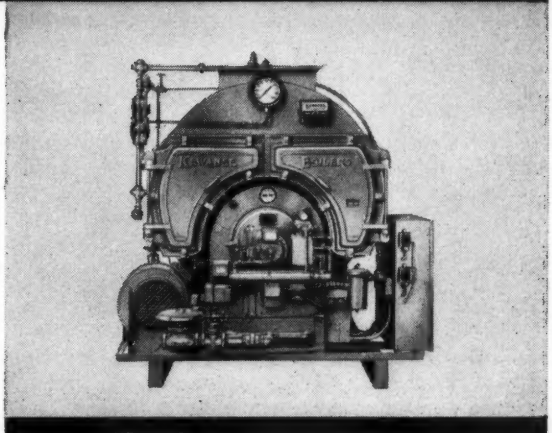

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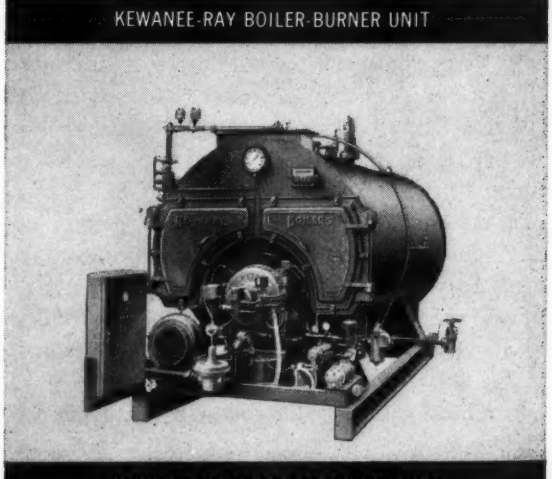

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THE CONSULTING engineer is very much affected by the general level at which the nation's economy is operating. During periods of boom and economic expansion, business men are usually optimistic about the future. They are inclined to allocate funds for consulting services. There is need for such services then because new engineering and production problems are constantly arising.

Consulting firms tend to be particularly hard hit during periods of recession, falling markets, and reduced income. Business men are then inclined to be pessimistic. Funds are scarce and the curtailment of production is not likely to introduce problems calling for the services of a consulting engineer.

Growth and business expansion have been characteristic of our economy during most of the years since the outbreak of World War II. It is certainly not an accident that during this period consulting service has boomed to the proportions of a big business in the United States. It is perhaps not unrelated either that this period has witnessed large government expenditures and a mounting government debt. Thus, the consulting engineer is vitally concerned with the effect of this government fiscal policy on general business conditions.

Program for Stability

In a report issued this fall, the Policy Committee of the Committee for Economic Development dealt with some of the responsibilities of government in times of large expenditures and a large debt. Economic stability, it asserted, should be a goal of national policy. The report stated that "not only must the government prevent the national debt from disrupting the growth and stability of the economy, but the government must also attempt to turn the debt to good use by using it as a means of promoting economic stability."

Government fiscal policy to achieve such aims must be flexible. What is sound policy to combat a recession may be disastrous in a boom. The crux of the problem of maintaining a balanced economy is to increase purchasing power during periods of threatened recession and to keep purchasing power from expanding, or even to decrease it, during periods of inflation.

Checking Inflation

At times when inflation is a serious problem, an anti-inflation policy calls for the government to take in more money than it is spending. In short, the national debt should be contracting—not expanding. An expanding debt only adds fuel to the inflationary fire. Let us see why.

Suppose that the government has decided to embark upon a substantial flood protection program that will cost a billion dollars. The billion dollars can be raised by taxes. Dams, however, are not made out of dollar bills. They are made of steel and concrete. They require manpower and engineering design. But during inflation, prices are rising because people are bidding against each other for materials and manpower. These items are in short supply already, and a dam-building program will cause resources to be diverted from other uses.

Here is where those taxes perform a very important anti-inflationary function. Individuals who are taxed find that their incomes are reduced. They can no longer buy as many things as they previously could. They use fewer resources. Since resources are thus released, the government can step in and buy what it requires without bidding prices up any further. True, some prices may rise, but the general price level would not be affected appreciably.

Suppose, on the other hand, that the government decides to raise the billion dollars for its project by borrowing the money. When the government borrows money, it obtains the money through the sale of bonds to the investing public. These bonds are IOU's payable with compound interest and redeemable at some specified date in the future. There is nothing compulsory about the sales. People with sav-

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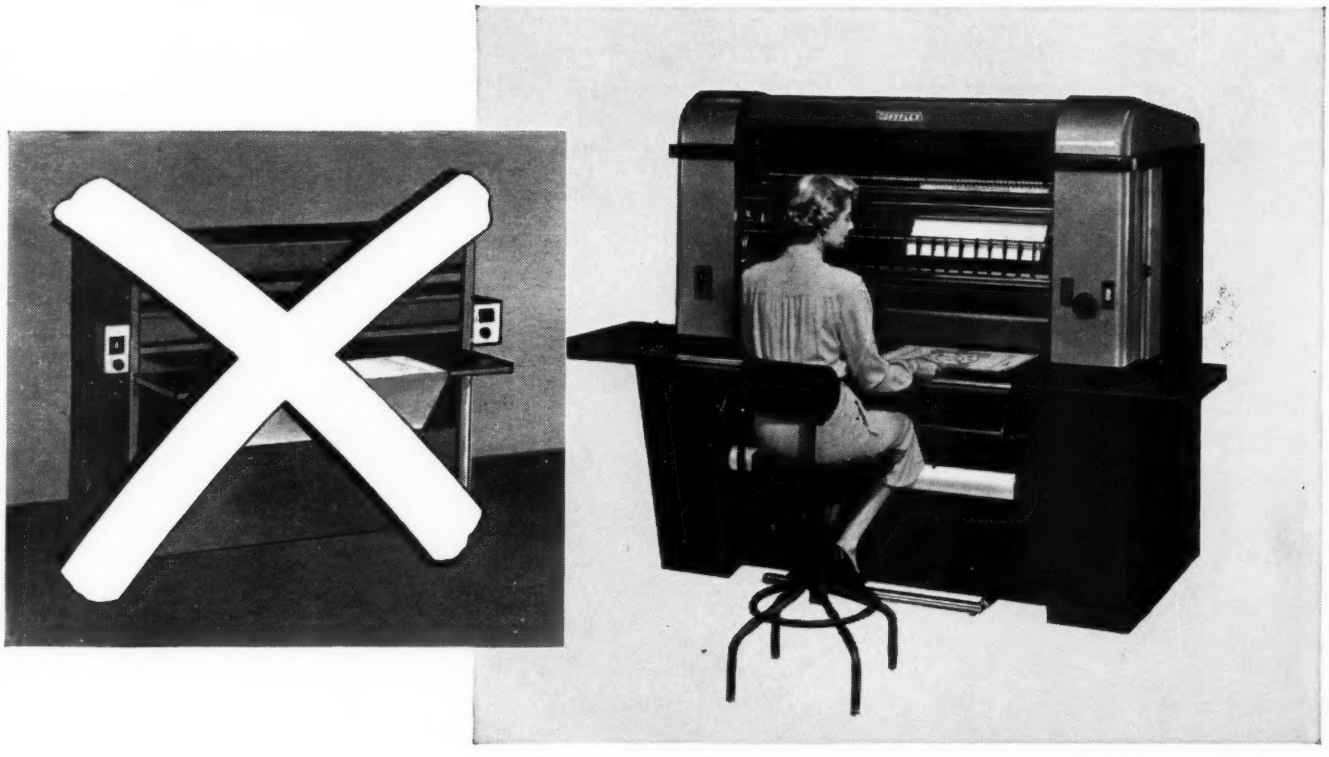

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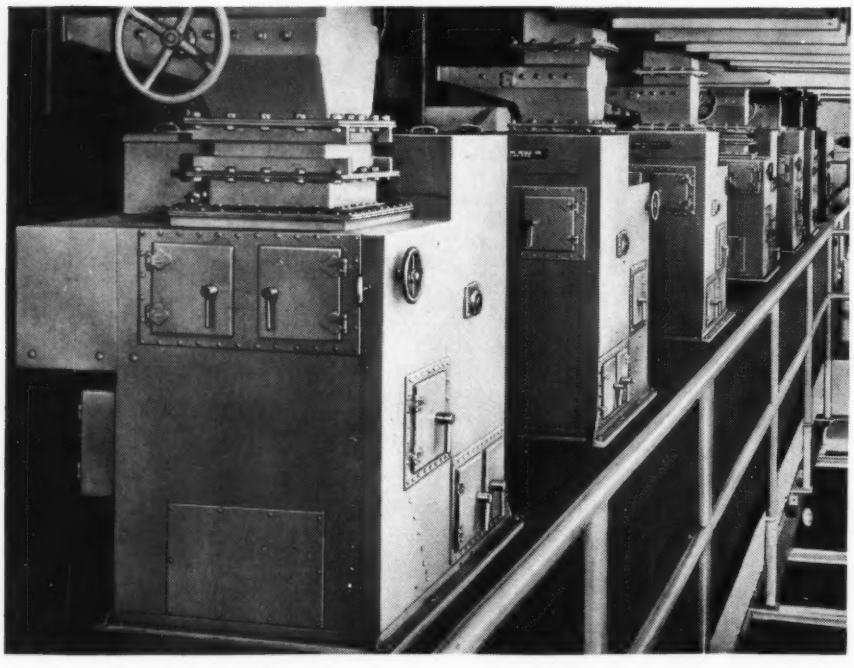

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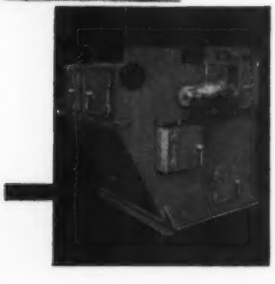

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ings will purchase these bonds as readily as they will invest in private securities. What will be the effect on the impending inflation?

If the bonds are sold to people who would otherwise spend the money for automobiles, refrigerators, and the like, then the bond purchases help damp the inflation. But the bulk of bond sales are not to people of this type. Bonds are chiefly bought either by individuals and insurance companies with funds they were going to salt away anyway—which does not reduce total spending in the economy—or by banks.

Furthermore, the Federal Reserve Banks usually print Federal Reserve Notes to pay for the bonds. Commercial banks may pay for the bonds they buy through creating demand deposits and crediting them to the seller of the bonds. Thus, the debt in bonds leads to an increase in the amount of money in the economy. The demand for commodities of all sorts rises rather than falls. When the government finances its expenditures by borrowing, it is adding to the strength of the inflationary forces. The economy becomes further unstabilized.

Checking a Depression

If we face the danger of a recession, the stabilizing policy would be the opposite of that appropriate to halt an inflation. If the government takes in more money in taxes than it is spending, total purchasing power tends to be reduced—a policy contributing to the danger of a recession. If on the other hand the government borrows the money, total purchasing power will tend to increase—a policy contributing to greater stability. In the latter case the national debt will, of course, increase. The problem of the national debt is a separate one, however. (A discussion of the impact of a large debt on the economy will have to be deferred until a later time.)

The Employment Act of 1946 established the Council of Eco-

nomic Advisers to provide the President with expert information and guidance regarding the economic situation. Reports from Washington indicate that the Council, composed of highly respected professional economists, is currently trying hard to provide a running assessment of economic conditions. This is no simple task. American industry is big and varied, and what turns out to be a major trend is frequently not immediately predictable.

As far as the consulting engineer is concerned, he will be well repaid when planning his own business if he will observe the course of government expenditures because of the impact they inevitably have on the economy. It is of particular interest to consulting engineers that some of the projects likely to materialize if anti-depression measures are needed will require some engineering — for example, the construction of a superhighway system. Thus the consulting engineer may benefit in two ways from the establishment of a stabilizing fiscal policy. He can share in the over-all profits of prosperity, and he has a special interest in the adoption of projects requiring substantial engineering. ▲ ▲

cℓ quotes - -

Public works must be paid for always out of taxes. These taxes fall as a heavy burden on all who are employed; and furthermore they act as a powerful depressant upon the entire economy. Thus they tend to diminish the total number of permanent jobs and to delay the creation of new ones. But with private works, it is just the opposite. They do not eat taxes; they pay them. . . . Moreover, these projects are financed, voluntarily, out of savings which might otherwise lie idle.

Benjamin F. Fairless
Chairman of the Board
United States Steel Corporation

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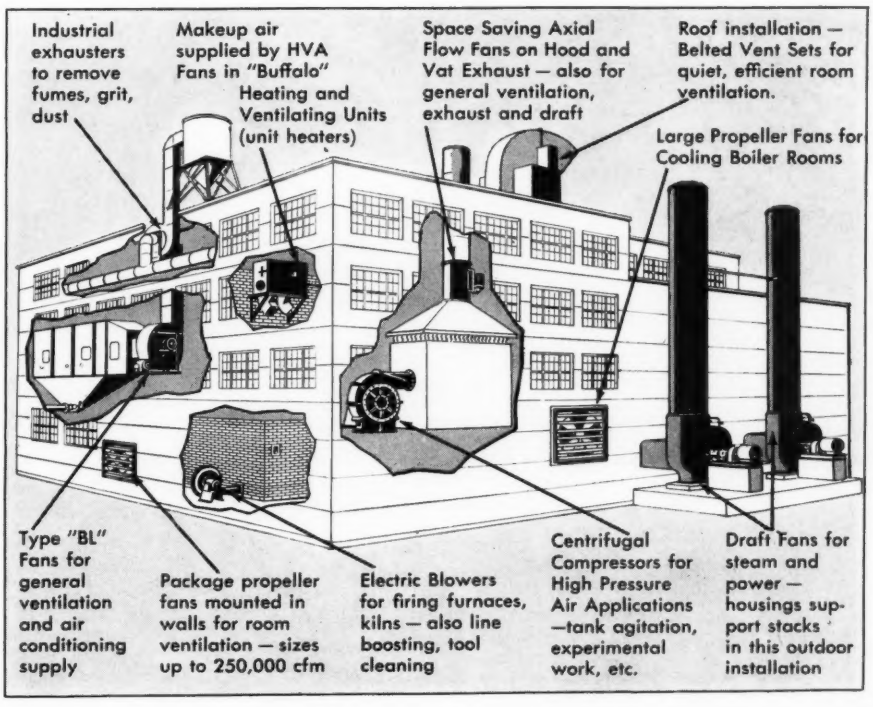
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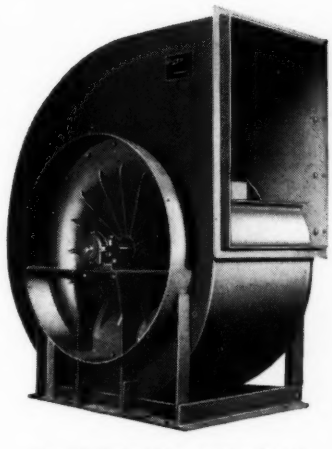

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Consulting Engineer's Survey of the Profession

A FEW WEEKS AGO, the Editors of CONSULTING ENGINEER sent out a questionnaire to each firm of consultants on its circulation list. This required a very large mailing even though only one questionnaire was sent to each firm, whether it was a 2000-man or a 2-man organization. In every instance, the letter was addressed to one of the top men in the firm — a partner or principal.

The return was surprisingly large, despite the fact that the questionnaire consisted of three pages, all requiring some thought. Because of the size of the return, the results presented on the following pages represent much more than a small sampling. In fact, there is an answer from about one of every two consulting firms in the country. This means that the answers can be presumed to be very accurate. And they are certainly interesting.

So far as we can determine, this is the first time a lengthy survey has been made specifically in the field of consulting engineering. It should give you some idea of how your fellow consultants feel about a number of questions important to the profession.

It is physically impossible to make a detailed analysis of all the comments made on these forms in time for publication in this January issue. During the coming months such an analysis will be made. We will publish, from time to time, articles and reports based upon ideas offered in the numerous remarks made on the questionnaires.

I—GROWTH OF THE PROFESSION

A. Is the market for consulting work growing?

Yes—90.6 percent **No—9.4 percent**

It is obvious that consulting engineers are extremely optimistic as to the outlook for growth in the field in 1955. If the consultants' own estimates are right, the year ahead will be the best that consulting engineers have ever seen, so far as new business and increased income are concerned.

The replies from engineers who thought business was on the decline indicated that they are running into severe competition from several sources. First, there are complaints that a great deal of business that should be coming their way is being handled by the engineering departments of manufacturers and suppliers. (See "Are You A Consultant Or Broker," page 55) Another complaint is that a great many architectural firms are adding small engineering departments, and then are offering to take major engineering projects—thereby cutting the true consulting engineer out of the picture.

One geographical aspect of the replies has to do with the area around Washington, D. C. It seems that a great number of ex-government men have set themselves up as consultants in that city and have upset the normal ratio of supply to demand. Around Washington, there seems to be more engineers than there are engineering projects. This leads many consultants in that area to feel that business will be bad in 1955.

Comments

Ever since D. C. passed the registration law, new men are coming into the field fast. Every time a federal engineer gets fired he opens up a "one show" office, pulls prices down, then folds up and goes back to work for the government. (Washington, D. C.)

Many of the larger companies are establishing their own departments for design and engineering. (Champaign, Illinois)

Things seem to be slow in Mississippi. (Jackson, Mississippi)

Equipment manufacturers are engaging in engineering work as they did during the depression. Some are even contracting for field work. (Chicago, Illinois)

The tendency seems to be to give away engineering in order to sell a product or a project. (California)

Twenty-five years ago there was more work for

consultants. Now architects, contractors, manufacturers have more engineers on their own staffs. (Illinois)

In this area things are static. (Sioux Falls, South Dakota)

To balance these few engineers who feel that business is going to be worse next year, there is the overwhelming 90.6 percent who think business is going to be better.

We are expecting additional business in 1955. (New York)

The market is growing as far as we are concerned. We are only eight years old as an organization and each year our business has increased. (Dallas, Texas)

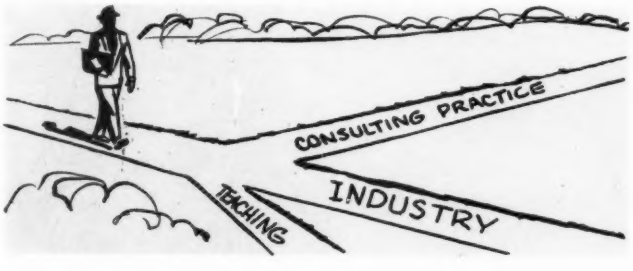
It looks like business will be better in this region at least. (Colorado)

As this community becomes more industrialized, people become aware of the need for engineering services—business is growing. (Minneapolis, Minnesota)

The demand for consulting services appears to be growing on a permanent, sound basis. (Virginia)

The demand for consulting services is growing, but continually changing in aspect. New fields are opening while some formerly remunerative fields are disappearing. (Michigan)

Analyzing the answers as a whole, it would seem that the engineers in the East—New York, Boston, Philadelphia—are less enthusiastically optimistic about business than those in some other parts of the country. As might be expected, there seems to be more demand for consulting services than there are consultants in the Southwest, in Florida, and most strikingly in the Far West. All the way from Washington through Southern California, the answers indicate an enormous demand for consultants. This is in spite of the terrific number of consultants who have moved to the West Coast in recent years (See "California Here We Come," page 52.)



B. Are more engineers entering the consulting branch of engineering?

Yes—91.9 percent **No—8.9 percent**

The comment on this question is more enlightening than the actual percentage figures. There is general agreement that the consulting profession is growing in size. Some think that this growth is only in accord with normal business growth throughout the country. By far, the largest percentage think that consulting is growing faster than other fields of engineering —perhaps too fast.

Many of the returns indicate a feeling that too many young, inexperienced, or incapable persons are entering the profession.

Comments

Too many engineers without particular specialties are setting up individually as consulting engineers. (Jackson, Mississippi)

Changes in government induced many to leave and go into private practice. (Washington, D. C)

A good many young engineers released from military service have set up in business since the late 40's. (Nashville, Tennessee)

There are 50 percent more firms in our field in the past 3 years (mechanical and electrical). (San Francisco, California)

There do not appear to be many entering the profession in this area. Right now there is an acute shortage. (Minneapolis, Minnesota)

The number of consultants in this area has tripled in ten years. (Minneapolis, Minnesota)

There are always some who come and go. Those who stay and are successful are few. (St. Louis, Missouri)

Too many engineers are entering private practice when they reach age 65 and retire from industry. (Canton, Ohio)

Many engineers work for larger groups on a single program and then splinter off to set up their own practice — a good trend. (Connecticut)

Many are going into consulting engineering, but a large number of these fail because they are unable to handle the business end of it. (Philadelphia, Pennsylvania)

A lot of "kitchen sink" consultants are operating from their homes. (Chicago, Illinois)

Too many are entering the consulting branch, which results in many engineers accepting work for which they are not fully qualified. (Des Moines, Iowa)

The number of consultants in this city has doubled in the last five years. (Central New York State)

It seems that many small organizations are opening their doors. Some succeed, some fail. Even though this means added competition, I am glad to see the attempts made. (California)

Many inexperienced men go into business every day, but they soon get into a jam and have to quit. In the meanwhile they take jobs away from established concerns. (Detroit, Michigan)

College professors compete for our work. Many use state equipment to do competitive consulting work. (Oregon)

The period from 1945 through 1954 has been the

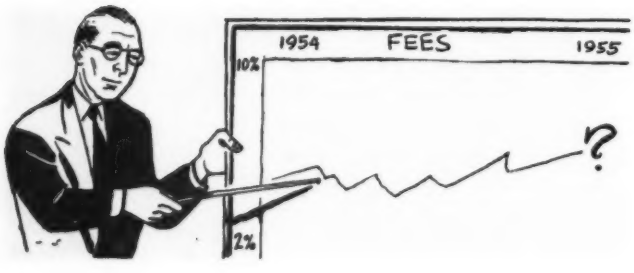
easiest period in history to become established as a new firm in private practice. (Kentucky)

It would seem from this survey that many consultants resent the large number of retired engineers from industry and the part-time college professors who set themselves up in private practice. These men must be taking work away from established consulting firms, or there would not have been such a high proportion of answers calling attention to this condition. On the other hand, whether it is wishful thinking or not, there is also a general belief that most of the new firms are made up of inexperienced men who are not qualified for general engineering work. The feeling was also frequently expressed that the business side of consulting (as opposed to technical qualifications) is behind a lot of new firm failures.

Things to Watch

¶ Many of the new consulting firms are being established by older men retired from industry or "specialists" fired or retired from government work.
¶ Industry seems to be getting the brightest young engineers.
¶ Consulting firms are having a hard time finding or keeping bright young graduates.

II—FEES AND COMPETITIVE BIDDING



A. Is there an increasing tendency toward fee cutting by consultants?

Yes—45.4 percent **No—54.6 percent**

This is a surprise. Almost half of the consultants think that there is an increasing tendency toward fee cutting. A little more than half feel there was not. Both groups absolutely denied ever having indulged in such nefarious practices themselves. In other words, about one-half said, "Sure, consultants are cutting fees, but we would not do a thing like that." The other half said, "We wouldn't do a thing like that and we don't know anybody who would." One man suggested that professional ethics improves in direct ratio to the profession's prosperity. "Ethics are always high," he said, "when business is good. Just let business get bad again, and every firm will start cutting fees." There is undoubtedly some truth in his widely held opinion.

Comments

If I am foolish enough to let a client whittle my fee, I tell the client my services will be whittled in proportion. Other consultants do the same thing, except that many do not tell the client about their own whittling. (San Francisco, California)

We lose many jobs to engineers in governmental agencies who bid very low on jobs and who have no overhead cost or wages to pay, these items being paid by the taxpayers. (Billings, Montana)

A young inexperienced firm of engineers could easily bid one-third the fee of an older firm, but if engaged, they could not possibly do the job properly. (St. Louis, Missouri)

Fee cutting is primarily attributable to clients asking for competitive bids for professional work. (Oregon)

Fee cutting occurs when larger engineering firms run short of work. (California)

B. Can you think of any jobs you have lost in recent months because of price bidding on the part of other consultants?

Yes—44.9 percent **No—55.1 percent**

It must be remembered that price bidding is not the same as fee cutting, but would include fee cutting. Price bidding includes all types of competitive bidding on a fee basis as well as fee cutting. It is interesting that almost half of the consultants answering this questionnaire had actually lost some jobs because of one of their competitors being willing to do the job cheaper.

C. Is there any indication that a sizable number of firms are dealing in "kickbacks?"

Yes—11.7 percent **No—83.3 percent**

A very high percentage of consulting engineers do not think that there is any sizable amount of dealing in "kickbacks" within the profession. How-

ever, the 11.7 percent who feel that a sizable number of consultants are dealing in "kickbacks" seems very high. Apparently, these men have some opinion, but very few indicate direct knowledge.

Comments

A consulting engineer should get his work on the basis of ability, not on the basis of a kickback. A kickback artist is not serving his client. (Tennessee)

Salesmen of equipment firms have offered me kickback arrangements stating that others are doing the same. In a few instances they have named names. However, I want no part of it. (Ohio)

We have no direct knowledge of any kickbacks. (New York City)

I know nothing definite — but I have my suspicions. (Florida)

I hear a great deal about kickbacks but never have been directly approached — however I have been approached by another engineering firm about turning over to them whatever work we turn down, and I was offered a percentage for so doing. (Pennsylvania)

I just do not take work where they expect a kickback. (West Virginia)

The rumors are that the kickback is confined to public works although we as yet have not been effected. (New York City)

I have no knowledge of kickbacks. This is out of the realm of ethics and into crime. (Texas)

My relationship with clients does not depend upon kickbacks. I have very little knowledge as to how other consultants work. (Kansas City, Missouri)

We have run into this in a few isolated cases. (New York City)

D. Are kickbacks confined primarily to public works projects?

Despite the fact that only about 12 percent of the answers indicate an opinion that any sizable number of firms is dealing in kickbacks, a full 20 percent of the answers indicates an opinion on whether kickbacks were primarily confined to public works. Here the results show a startling 50-50 division. Exactly half of those answering this part of the questionnaire think that kickbacks are confined primarily to public works projects. The other half think that it is also common for industrial firms. If these men know what they are talking about, you could expect an approach on a kickback from an industrial purchasing agent just as much as from a public works agency. This is rather surprising, because we occasionally hear of scandals based on this type of activity in public works, but almost never do we hear of one in private industry. Apparently, when this type of thing is discovered in private industry, it ends up in no more than a firing of the purchasing agent instead of a front page news story.

E. Do you think that competitive bidding for engineering work is compatible with engineering as a profession?

Yes—9.3 percent **No—90.7 percent**

Despite the fact that less than 10 percent of those answering the questionnaire feel that competitive bidding is compatible with engineering as a profession, this question brought about some of the most interesting comments. The comments against competitive bidding follow a fairly standard pattern.

Comments

All engineers should quote fees conforming to schedules published by engineering societies. (Jackson, Mississippi)

Do you ask a doctor to bid on an operation? (Des Moines, Iowa)

Hell, no! (Kansas City, Missouri)

Ability and past experience cannot be sold on a competitive basis. (Baltimore, Maryland)

This firm has refused to send representatives to discuss work where bidding procedures are involved. (Chicago, Illinois)

Dozens of cases have come to our attention where this practice has resulted in grief and poor work for the client. It is a practice encouraged largely by federal and local governments. (Ohio)

I do not understand this question in view of the fact that the position of the Founder Societies and

Competitive bidding for engineering services on a price basis, where the price is the only consideration, will retrograde the professional aspect of engineering at least thirty years. Unless engineers themselves do not condone nor participate in such a competition, engineering will never be regarded as a profession. This undesirable practice should be eliminated by the State Engineering Registration Laws and by the Code of Ethics of the Engineering Societies.

Edmund Friedman, Principal
Maurice H. Connell & Associates
Consulting Engineers

of the ASCE is clearly opposed to the unprofessional practice of price competition. (New York City)

If this becomes common practice we shall have lost our claim as a profession. (Raleigh, North Carolina)

We never compete. The instant a potential client admits we have been the second (or more) to be dickered with—we bid him a fond farewell. (New York City)

If definite specifications for engineering work are given to several engineers, I would consider this competitive bidding and wrong. If the engineers are requested to bid on their own specifications, I would not consider this competitive bidding. (Watertown, New York)

Private industry is just as guilty of asking for competitive bids as are government agencies. (Chicago, Illinois)

Completely destructive to all hope of professional status. (New York)

This firm will not knowingly compete on a price basis against any other firm. (Texas)

Doctors and lawyers do not bid. (Oklahoma)

Talents cannot be measured in dollars and cents —else you would always hire the highest bidder. (Ohio)

The U. S. Government is a chief offender. We have had experience with Wright-Patterson Air Force Base. They definitely ask for bids for creative engineering work. We raised hell about it. Have talked with my Congressmen. No results. (Ohio)

The minority who favor competitive bidding had some very interesting comments to make:

Competitive bidding is being done to some extent by a majority of engineering firms, so the profession might as well recognize it instead of evading the matter by calling it by some other name such as "Proposals." (California)

The only fair procedure for selecting engineers on public work is by open competition in a program designed and judged by a Board of Engineers. This eliminates the disadvantage of high-pressure selling and will bring out many high-class engineering organizations which today have little or no opportunity to compete with large firms. (Ohio)

There must be some competitive bidding on many public projects to comply with legal requirements. It is asinine to contest the facts. (Wichita, Kansas)

Competitive bidding is perfectly logical on routine design work. (New York City)

I believe that precedent has set the pattern. Competitive bidding is assumed to be proper business procedure on new business by most firms. Repeat business is quite often negotiated. (Wisconsin)

Competitive bidding does "streamline" some organizations having high overhead. (New York City)

Everything is competitive. If I am asked to give some idea of cost of a job, I do so. (Tennessee)

The firm that knows its business is capable of bidding competitively, making a profit, and producing first-class work. (California)

There is no reason why competent consultants should not be able to evaluate their services in the same manner as a contractor. (California)

Free enterprise should follow through all phases of American life. (New York City)

The quality of work does not necessarily have to suffer because of competitive bidding. (Colorado)

• Editor's Note: Canons of Ethics say nothing about bidding. It is ASCE Code that forbids bidding.

III—UNIONIZATION

A. Are any of the engineers in your organization members of an engineers' union?

Yes—2.3 percent **No—97.7 percent**

The questionnaires show that consulting engineers have relatively little interest in engineers' unions and a surprisingly small background of information on the subject. Apparently, most consultants think that the unions are interested only in organizing engineers in large industries. Many of the answers indicate that it is not even known that efforts are being made to organize any type of employee-engineer on any type of job.

The four-year old Engineers & Scientists of America now have a membership (40,000) larger in number than three of the four Founder Societies, and the same size as the National Society of Professional Engineers. (See "Engineers' Unions Are Here," page 37).

While it is true that the ESA so far has concentrated largely on engineers in manufacturing plants, it has indicated a strong interest in the results of surveys conducted last year by several of the Founder Societies. These surveys show that of the engineers qualified for union membership, almost half think that such membership would be valuable to them personally. The ESA is particularly interested in the results of the American Society of Civil

Engineers' survey, and stated editorially that they are ready to help all interested civil engineers in forming their own collective bargaining locals. Many of these men work for consulting firms.

An analysis of the questionnaires indicating the existence of union members within consulting organizations shows that most union activity in consulting firms is currently limited to the Far West and the metropolitan centers of the East—New York and Boston. California tops the list for union activity.

The consulting firms having engineers in unions do not seem to follow any particular pattern so far as size is concerned. The smallest has a staff of only four engineers, while the largest has over a thousand. Most of the firms dealing with unions are in the 10- to 50-employee range. The union apparently pays very little attention to size so far as consulting offices are concerned.

Indications are that if you have never heard of Engineers & Scientists of America you soon will.

B. Has the Engineers & Scientists of America or any other engineers' union made any effort to organize your staff?

Yes—3 percent **No—97 percent**

Answers indicate that the Engineers & Scientists of America and other unions just have not yet gotten around to working seriously on consulting firms. In only a very few instances (one-half of one percent) is there a "Yes" answer to both "A" and "B" of this question on unionization. In other words, very few of the union engineers in consulting offices are members of unions because of any drive on the part of a union organization. It would also seem that the unions failed in their membership drives in almost every instance involving consulting firms. This is encouraging. But just how hard did the unions try?

Comments on the question of unionization of engineers, while frequently indicating lack of information, are interesting.

Comments

ESA is well established at Minneapolis-Honeywell and may be planning to expand. (St. Paul, Minnesota)

Unionization would be beneficial to the profession so long as it follows the pattern of the American Medical Association and similar unions (sie). (Philadelphia, Pennsylvania)

I personally have been approached by mail but do not remember the name of the organization. (Cleveland, Ohio)

No concerted effort is being made as far as I know. Our local engineering societies do not look upon this movement with favor. (Kansas City, Missouri)

I have heard rumors only and do not know what unions are involved. (New York City)

I feel that professional work should not be run by "kennel dog" union racketeers or "kennel dog" bureaucrats, either. (Seattle, Washington)

An abortive attempt was made to unionize survey crews on one of our supervision jobs about a year ago, with no success whatsoever. (New Jersey)

I am unaware of any current activities by unions. (Philadelphia, Pennsylvania)

In this state there is no concentrated effort to organize engineers, either professionally or in the form of a union. (Oregon)

There is some activity in the Seattle area. (Washington)

So long as consulting firms exercise reasonable employee relations with respect to giving employees hospitalization insurance, notice of layoff, a coffee break, unions will find little to offer. (Chicago, Illinois)

Just a week ago a number of engineers on a housing project announced they had organized. I don't know which union. (Denver, Colorado)

A few men are organized under the technical division of the operating engineers. There's little or no effort to organize our design staff. (California)

I do know that the unions fight for the man. The professional groups further their own advancement

Labor unions are primarily for the protection of the worker . . . [However], they promote and protect the inefficient, the laggard and the careless at the expense of those who can and would produce efficiently . . . . A union would ultimately destroy the creative ability, the energy and development of the true engineer . . . . Engineering education is inadequate and the qualifications for license too low. More time should be spent in school on the fundamentals, their demonstration and the solving of actual engineering problems. Less general lectures, which are generally beyond the full understanding of the student, and more work is needed.

Thomas A. Lucy
Consulting Engineer

only. They will not assist the man alone. (New York City)

The only engineer who demands a union is an insecure, lazy, incompetent man. (New York City)

There is some union — the exact name I do not know — but it is basically the Professional Engineers. (Delaware)

The Professional Engineers in this area are actively fighting the establishment of engineering unions. (Philadelphia, Pennsylvania)

IV—ENGINEERING SOCIETIES

A. Are you a member of one of the Founder Societies?

Yes—58.3 percent **No—41.7 percent**

The membership in specific societies can be broken down as follows:

ASCE — 26.1 percent ASME — 23.4 percent
AIEE — 13.8 percent AIChE — 2.4 percent
AIME — 1.5 percent

• Editor's Note: Many consulting engineers belong to more than one society.

Comment

We find the Founder Societies failed to do any thing for us as a group. I am a member of the Minnesota Association of Consulting Engineers. (Minnesota)

None of the Founder Societies seem to be interested in the engineer's standard of living. They are controlled by management men interested in keeping a supply of engineers in excess of demand all the time. However, their accomplishments in the academic field are commendable. (New York)

B. Are you a member of the American Institute of Consulting Engineers?

Yes—5.1 percent **No—94.9 percent**

This is a very interesting pair of figures. Actually, the American Institute of Consulting Engineers is the only existing society for consulting engineers on a national basis. However, this organization has never made much of an effort to secure members outside of the New York metropolitan area, though it does have a few members in other parts of the country. Their current membership is something over 200 members. With such a small membership, it can hardly be called a national organization.

C. Are you a member of the National Society of Professional Engineers?

Yes—54.6 percent **No—46.4 percent**

This would indicate that the National Society of Professional Engineers has done a very good job of securing membership within the ranks of consulting engineers. Since almost all consultants are registered, the NSPE has signed up more than half of their potential from the ranks of consultants. Compare this with the less-than-10-percent signed up by NSPE among all engineers. However, it must be recognized that many engineers in industry are not registered, and are therefore not even qualified for membership in NSPE. It is worth noting that more than twice as high a percentage of consulting engineers are in NSPE as are in any one of the Founder Societies, the closest Founder Society being ASCE with 26.1 percent. Thus, NSPE can speak more for more consultants than any other society.

D. Are you a member of a State or Regional Society of Consulting Engineers?

Yes—33 percent **No—67 percent**

A careful analysis of the returns indicates that there must have been considerable misunderstanding of the question. It would be more accurate to

say that this figure represents the number of consultants who belong to state or regional engineering societies rather than state or regional *consulting* engineering societies. It seems apparent that a great many persons, in answering this question, missed the word "consulting," for many of them listed their state society of professional engineers or their city or regional engineering society as the organization to which they belong. It can be assumed that the only accurate information to be gained from this question is that approximately one-third of the consulting engineers belong to some sort of state or regional engineering group.

Comments

The private practice section of the State Society of Professional Engineers was organized four years ago, but seems to be falling by the wayside. It is believed that a National Society for Consultants would be stronger and carry more weight. (Des Moines, Iowa)

No consulting organization is in existence in this region. Foundation of such a group is being considered. (Idaho)

Engineers require same effective organization as doctors. (Illinois)

I consider these state societies a bunch of political tape pullers. (Philadelphia, Pennsylvania)

I feel that in this area the only way consulting engineers can operate is to form some sort of consulting engineers group similar to the group in New York. Then we could weed out the "fast operators," the deadbeat owners and architects, and especially the "night hawks," or one-shot architects, who do a job and then fade away. (Washington, D. C.)

Meetings with engineers are practiced boredom . . . we have grown tired of hearing our elders tell of their accomplishments at these solemn meetings. (New York City)

I belong to the Minnesota Association of Consulting Engineers — don't need anything else. (Minneapolis)

The consulting profession cannot be strong until it unites into one group. (Connecticut)

V—THE SHORTAGE OF ENGINEERS

A. Is your firm having difficulty keeping a full staff because of a "shortage?"

Yes—25 percent **No—75 percent**

In other words, exactly one quarter of the consulting firms are having trouble getting men and are attributing their trouble to a shortage of engineers. This does not seem to be regional, although the Middle West — from Detroit to Chicago — seems to show a higher percentage of firms having trouble getting enough engineers than any other single region of the country. The Southeastern states and California also indicate some tendency toward a shortage of engineers.

B. What salary range should a graduate engineer of average talent and 5-10 years normal engineering experience expect if he went looking for a job?

The median answer to this question is in the range of $5000 to $7000 per year. The lowest figures suggested are $2500 to $5000 per year (Arkansas) while the highest figures suggested were $12,000 to $15,000 (Texas, naturally).

Contributing to the shortage felt by many firms is the fact that today's graduates are starting out at $350 to $400 per month. This generates dissatisfaction in men who started out five yeas ago at $250 and who only now have reached $350 or $400. The experienced men walk out when they see new graduates drawing the same pay. Salary figures will be analyzed in more detail and the results published in a later issue of CONSULTING ENGINEER.

VI—MISCELLANEOUS

A. Are you registered in one or more states?

Yes—94 percent **No—6 percent**

For the most part, the non-registered engineers are in diverse, specialized fields such as ceramics, management, and product design.

B. Is your consulting firm incorporated?

Yes—20.6 percent **No—79.4 percent**

By far the majority of consulting engineering firms are still partnerships or individually owned. Most firms have "active" partners only. ▲▲

Setting Your Fee

DAVID C. PFEIFFER
Consulting Engineer

Mr. Pfeiffer is a consulting engineer in Dallas, Texas. He is a mechanical engineering graduate from Lehigh University. Shortly after graduation he went with the General Electric Company, where he worked for the turbine engineering department.

Later he went with Texas Power & Light Company, where he worked, first, on the design of power plants, and later on various engineering problems of large industrial customers.

He has been in private practice as a consulting engineer since 1946.

THE REAL MONEY IS IN PROJECT DESIGN AND SUPERVISION OF CONSTRUCTION. LEAVE THE PERSONAL SERVICES TO THE PROFESSORS.

WHILE MOST consulting engineers are in this field by choice, and while most of them like their work very much, it is hardly necessary to state that one of the principal reasons for practicing engineering is to make some money.

The various methods used as a basis for charges for professional services are divided into five classifications: Per Diem, Annual Retainer, Percent of Work, Lump Sum, and Cost-Plus-A-Fee. The types of services normally offered can be divided into two general classifications: personal services and project design. Under personal services would come direct personal service, appraisals, valuations and reports, management and production engineering services, inspection, and testing of apparatus, equipment, or plants. Under design projects would come the design of a project such as a power plant, a refrigeration system, or an air conditioning installation. Design projects can be subdivided into preliminary design and cost estimates; design engineering, which would include preparation of drawings and specifications; and engineering services during all stages of construction.

It is generally felt that the charges for personal services should be based upon Per Diem, Annual Retainer, or Lump Sum—while the charges for design projects should be based on Percent of Work, Lump Sum, or Cost-Plus-A-Fee. These classifications apply only to work done directly for the owner, not for architects or other engineers.

Written Contracts

Written contracts or agreements between the consulting engineer and his client should be prepared for each project. For small jobs a letter should be sufficient contract. In it, the scope of the work should be clearly defined, the service to be rendered accurately described, and the basis for compensation set forth—including the method for making payments during and following the project.

It is highly desirable on larger jobs to state approximately the number of drawings to be prepared. This is more desirable on a Lump Sum job than any type of Cost-Plus project. We have had instances where approximately 200 drawings were estimated, based upon the description of the work required by the customer, while actually over 600 drawings were made. The definition of what constitutes a change of scope also should be clearly stated (generally 15 percent of the work).

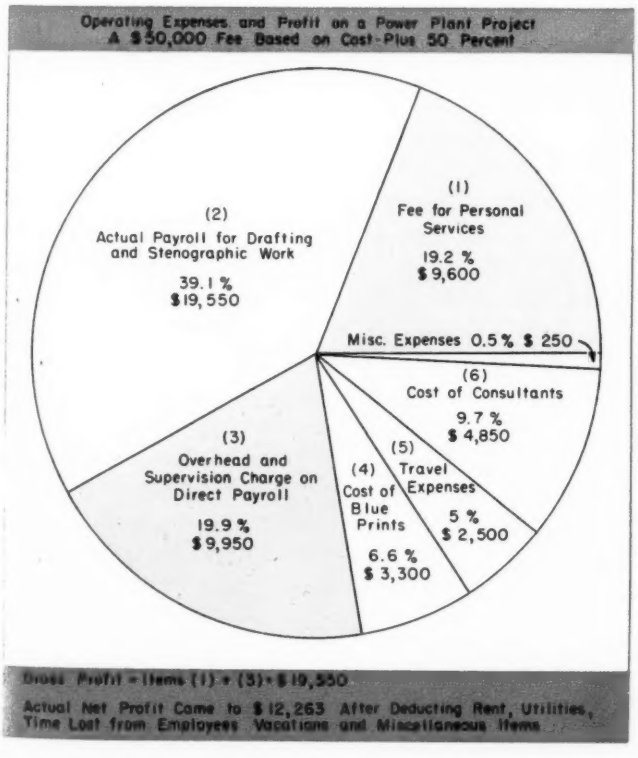
There are advantages and disadvantages in each of the five methods of charging for professional serv-

ices. Before suggesting or agreeing to a type of fee, the consultant should understand them so that he can choose intelligently.

Per Diem

The Per Diem is recommended for direct personal services, such as being called in to discuss problems or give an opinion to a client. When I first started practicing, it was my intention to secure a number of customers who would use my services on this basis. After some effort I secured approximately ten customers, each of whom used my services for approximately one day per month. The recommended minimum charge for professional services at that time was $40 per day. It was my thought that this would allow approximately one-half of the month for design projects and other types of work, permitting me to build a small organization.

It soon became apparent that the calls and demands upon my time by this group of clients was preventing me from doing the type of work that would ultimately result in more money. The maximum that could be made under these conditions, if all of my time were "sold," would be approximately $900 to $1,000 per month. While this may appear to be an adequate salary, it did not permit building up of any office organization. The losses incurred by idle employees and lack of adequate supervision and planning of work more than offset the Per Diem fees. I soon changed my method of doing business and retained only those Per Diem customers who had prospects of design work. Obviously, straight personal service work can be profitably handled only by the part-time college professors who have very little or no overhead and have spare time to sell.



ACTUAL BREAKDOWN OF COST AND PROFIT ON A JOB, TAKEN ON A COST-PLUS-50-PERCENT-FEE BASIS.

Annual Retainer

The Annual Retainer is a modification of the Per Diem charge, but it has some advantages to the consulting engineer that the Per Diem method does not. I have a few annual retainers, large companies who desire to have my services available if and when needed, and who are willing to pay for this privilege. My basis of charging for this type of service is really a Per Diem. But it is modified by making available to my client 12 days of service during each calendar year, which the client pays for whether he uses them or not. If during any calendar year, more than 12 days are used or if any design project is given me by the client, the time that he has paid for is credited toward his account—usually billed on a percent of the cost basis. This has proved much more satisfactory to me than the straight Per Diem basis, as it has usually resulted in sufficient design business to make it attractive.

From the standpoint of the client, he has the advantage of a prior claim to my services. It is apparent that serving a great many clients of this type might offer the same disadvantage as the Per Diem type of client, but I have never had more than two such clients at any one time. In practice, not over one-half of my paid-for time under this plan has actually been used.

Percent of Work

The Percent of Work basis for establishing charges obviously works only for design projects and would include the personal services necessary for preliminary conferences and studies to determine the best design, cost estimates, plus preliminary layouts and sketches. In the design phase it would include necessary field service, preparation of detailed drawings and specifications, an accurate cost estimate, assistance to client in securing bids, analysis of bids, and recommendations for contract awards. In the construction phase it would include checking of shop and working drawings furnished by contractors, consultation and advice during construction, general supervision of the work, and interpretation of the plans and specifications by periodic visits to the site. It does not include continuous supervision unless specifically called for. It should include checking of contractors' estimates for payment, a final inspection, and revision of construction drawings to show the project as built.

This general description of the work is applicable not only to Percent of Work Fees, but to Lump Sum, and Cost-Plus-A-Fee contracts. The Percent of Work would be the type of contract where the percentage fee is stated either as a fixed amount or

as a sliding scale applied to the actual cost of construction—including extras if necessary. This type of contract would provide very little incentive for the engineer to reduce costs. This would be a disadvantage to the owner in that the engineer might be inclined to be lax in reducing project costs. Obviously, increases in the cost of construction would increase the engineer's fee.

Lump Sum

The Lump Sum form of contract is one in which the fee is agreed upon in advance by applying a percentage of the cost to the estimated cost of the project. This type of contract is fair and equitable provided the scope of the job is accurately defined so that the cost estimate made in advance is realistic. We have several such contracts, and on most jobs the actual cost of construction has exceeded the estimate (which was prepared by the owner's engineers but checked by us) by 50 to 100 percent. In these, contracts provision is made for increases in the engineer's fee by a change of scope of work, which in our case is defined as a change of 15 percent or more.

In one recent job involving considerable research, it was impossible to accurately determine the cost. Renegotiation resulted in a material increase in our fee. This is probably the most common type of contract for design work for power plants, complete air conditioning systems, or process plants. It is generally offered by the government and large firms.

Cost-Plus-A-Fee

The Cost-Plus-A-Fee contract is one in which the client pays all of the engineer's direct costs, plus a percentage of some items to take care of overhead and profit. A percentage generally is allowed on the direct labor only although sometimes a percentage is given on blueprints. All cost items of the engineer — such as rent, utilities, and supplies — are included in his percent, which should be 100 percent of direct labor costs in order to assure a reasonable profit. We have done several jobs on this basis, and in practically all cases have used 100 percent of the actual labor costs, principally drafting, as a basis for our fee. We do, however, include all of the direct time of our principals at an hourly rate. This direct time is intended to cover design and not to include that time spent checking drawings or supervising work. Considerable judgment must be used when billing on this basis, as this system could easily be abused.

Several years ago one company objected seriously to paying 100 percent overhead on the cost of their blueprints. When this was re-billed on a basis to include the actual time of the people involved in handling the blueprints, it proved even more expensive to the client. In another instance we voluntarily put a top limit to the overhead on blueprints so as to make the charges for this service more consistent with what it actually cost. For example, if during a few heavy months a customer's blueprint bill was $1,000 per month, it would be most unreasonable to double this amount as reimbursement for the cost of handling. At the same time, if during stages of design when very little blueprinting was being done, the cost of blueprints was between $10 and $20 per month, it would not be unreasonable to double this.

On one recent job involving the installation of a 15,000-kw steam turbine generator, together with necessary boilers and auxiliaries, we had a contract on a cost-plus-50-percent fee. During the latter part of this job one of the customer's engineers made the remark that I was getting rich at their expense. He had to approve my bills and knew the total amount of money that had been paid. I realized that a very small part of this money actually represented a net profit to me. Therefore, I prepared a detailed cost analysis of the job.

Breakdown of Fee

We will assume for example that the gross fee was $50,000, although this is not the true amount. On this basis, the cost analysis showed that (1) my total fee for personal services was 19.2 percent; (2) my actual payroll for drafting and stenographic work was 39.1 percent; (3) the 50-percent overhead and supervision charge on direct payroll was 19.9 percent; (4) the total cost of blueprints was 6.6 percent; (5) the total travel expense was 5 percent; (6) the total cost of consultants was 9.7 percent; and (7) the miscellaneous expenses chargeable to this job (such as telephone, telegraph, etc.) was .05 percent. The total of item (1) and (3) (a total of 39.1 percent), which would represent my gross profit, is $19,550. Item (2) represents only my actual payroll cost chargeable to this job. The average cost for payroll expenses that cannot be charged to a job such as vacation, illness, and payroll taxes come to 25 percent.

This job required approximately two years, which represented an actual cost for rent, utilities, and such items of $2,400, which together with 25 percent of item (2) reduced the apparent gross profit in the fee from $19,550 to $12,263, or an average of $6,131 per year. The particular engineer who was critical of my $50,000 fee was making considerably more than the $6,131 per year. While it is true that during the two-year period only part of my time was given to this work, the analysis indicated very clearly to the customer that he was getting his engineering services for this particular project at a cost considerably under what he could have hired the necessary engineers and draftsmen for—if available.

In some cases I have found it necessary to put a top limit on a Cost-Plus-A-Fee job in order to assure a client, that he would be treated fairly. Many people object to cost-plus contracts in any form. The principal advantage is that it allows the customer to change his mind at will. ▲▲

CE exclusive

The Engineers' Unions Are Here

INDICATIONS ARE THAT MANAGEMENT DOES NOT KNOW HOW WIDE-SPREAD ENGINEERS' UNIONS HAVE BECOME.

STAFF REPORT

ALL TOO OFTEN, the principal speakers at an American Management Association meeting are eminent authorities who stand before the assembly and put forth arguments of which the audience is already convinced. They tell their pro-management listeners of the contributions that independent, unopposed management has made to the progress of America.

On the other side of town, in another convention hall, labor leaders stand on a platform before an audience of solid union members and present speeches on the contribution that collective bargaining has made toward the progress of America.

The result is a lot of wasted breath. Neither side ever hears what the other has to say. Each goes on and on, year after year, listening to itself.

Similar Situation

This same situation exists among engineers. As of this month the American Society of Mechanical Engineers (a 75-year-old technical society), the National Society of Professional Engineers (a 20-year-old professional association), and the Engineers and Scientists of America (a 4-year-old engineers' labor union) are the same size. Each has about 40,000 members. Yet, in June 1954, the Council of ASME had the boldness to make the following official statement:

"In the fall of 1954, members of the Society in the United States were asked, as a cooperative fact-finding effort without sister engineering societies, to express their opinion about unionization of engineers. The results show overwhelming national opposition to the idea."

But the compiled results of that entire survey show that between one-quarter and one-third of the group answering indicated that they thought collective bargaining would be to their own personal advantage. A much higher percentage (40 percent for the Civil's, for example) indicated that they were not opposed to collective bargaining for engineers.

Furthermore, as Dean N. W. Dougherty points out in his recent report to the Engineers' Council for Professional Development, it is important to remember that a high percentage of engineers are not even eligible for membership in labor unions. In fact, about a third of all engineers are employed in ad-

ministration and management, and are not, therefore, qualified for union membership. If we subtract this third, we can see that just about half of the engineers who could be in a union think that a union would benefit them. Could this be called "overwhelming national opposition." It would seem more accurate to say that the ASME Council has an apparent tendency to stick its head in the sand. Compare the 1953 survey results with the results of a similar survey held in 1946, in which less than 5 percent of the engineers favored unions.

Stop Talking To Selves

It is, therefore, about time that the governing bodies of the Founder Societies, Engineers Joint Council, and the National Society of Professional Engineers, almost all of whom are members of top management, stop talking to themselves and recognize what is going on around them. It is understood, of course, that the Founder Societies are not anti-union groups. They are technical organizations that have taken, with a few exceptions, little active part in either aiding or hindering the unionization of engineers. But Tom Marshall's statement when he was Secretary of the Engineers Joint Council, that "EJC cannot and will not become a collective bargaining agency, nor will the existing technological societies," just about fits the spirit of the top rank of the Founder Societies. All of these Societies take the position, unofficially, that unionism is not compatible with professionalism.

This mild animosity is not reciprocal. In their contract with Sperry Gyroscope Company, the Local of Engineers and Scientists of America wrote into the agreement with management a provision whereby the company would pay one-half of the basic annual membership dues in recognized engineering and scientific societies for certain classes of engineering employees.

Engineers who are part of management and the old and respected engineering and scientific societies have every right to oppose unions for engineers, either actively or passively. But, it would be wise to first look around and see what is happening. The Engineers and Scientists will not dry up and blow away just because we turn our eyes from them and refuse to admit that they exist. If we are going to oppose unions for engineers, it is essential that we know what we oppose; that we know what the unions are doing; that we know their arguments; and that we know how they are progressing.

Engineers and Scientists

The Engineers and Scientists of America got its real start on the West Coast in the aircraft plants, at Minneapolis-Honeywell, and at Sperry Gyroscope Company. Naturally, the first places to organize were the large companies where there were hundreds of engineers, many of whom felt they had no chance to bargain individually with management. While the organizers thought they had many legitimate grievances, perhaps the strongest was based on conditions that had arisen though the increase in starting pay for freshly graduated engineers. In 1950, for example, the starting salary for an engineer just out of college (Illinois Tech) was $250 per month. In June 1954, Illinois Tech reported starting salaries for their graduates of about $390. This means that some of the 1950 graduates have just barely kept up with the increase in starting salaries. When such men with two, three, or even four years experience see young graduates hired for almost as much as they are making, they become easy pickings for the engineers' unions.

Older engineers with five, ten, or fifteen years experience also noted the small difference between their salary levels and the salaries of the young graduates. This naturally aroused dissatisfaction. These facts must be understood before attacking the ESA for "leveling of salaries." Any spokesman for management who uses this approach is leaving himself wide open (as many have done), for the actual facts are that bargaining groups of ESA have fought against salary leveling. They have consistent-

To convince engineers that unionization is not desirable is not too difficult if engineer-employers do their part in recognizing the professional qualifications of their employees. Unionism thrives on discontent, frustration, and helplessness of individuals working alone without group support. Unionization of engineers will fail generally if recognition of merit and ability is given to individuals through proper advancement, proper salaries, and recognition of them as professional engineers. I have found that the average professional engineer is an individualist, resentful of dictation, proud of his professional attainments, and hence unwilling to delegate his progress or success to a labor union delegate. Only frustration can alter his attitude.

Organizations best suited for the job of convincing engineers of the undesirability of unionization seem to be the National Society of Professional Engineers, in general, acting through its state organizations.

Dean G. Edwards, Partner
Edwards, Kelcey and Beck
Consulting Engineers

ly asked for percentage increases in salaries and for "inequity adjustments for the higher classifications." They have opposed across-the-board increases of so many dollars per month for all engineers regardless of salary level. They have the facts to back them up on this, so management must find some other point of attack than the accusation of "leveling of engineers salaries."

Management Confidence

Another argument used against engineering unions involves professional ethics. Can an ardent unionist be taken into the confidence of management — a necessity in many engineering positions? This is one of those vague questions to which there can be no absolute answer. However, spokesmen for ESA point out that this is merely an accusation that all non-supervisory men are without principles. Actually, of course, there is no more reason to think that by joining a union, an engineer would divulge his company's trade secrets than to think a union pattern maker for General Motors would turn over new model information to Ford just because he was a union member.

Leo Lightner, Washington Representative, ESA, says, "Unless you hold that it is unethical for an engineer employee to seek a raise in pay or better working conditions, I am unable to perceive how collective action for the same purpose in any way involves a question of ethics." It seems that any anti-union argument based on ethics is a bit shakey.

Then, there is the question of union leadership. Who are the leaders? Can ESA be attacked on the leader level? Perhaps, but if so, there is no obvious weakness at present. The President of ESA is Joseph Amann, a native of North Dakota, 36 years old, holder of a masters degree in physics from MIT, an authority on high-vacuum techniques and optics, a registered engineer in Minnesota, and currently on leave of absence from his duties as Senior Process Engineer at Minneapolis-Honeywell. Biographies of other national officers and local officials read very much the same.

Current Status and Plans

The management in the average consulting firm may wonder how the growth of engineering unions could affect him. Are not these union engineers confined largely to the major industrial plants? Are they interested in organizing the non-supervisory employees in the consultants offices?

The answer to both questions is, "Yes." It is true that almost all membership drives of ESA have been in the large industrial firms — Sperry, RCA, Arma, Pacific Gas & Electric, Lockheed, Douglas, The Texas Company, Republic, and Minneapolis-Honeywell — but they are also very much interested in small firms, as is indicated by their reaction to the publication of the results of the ASCE survey on attitude toward unions. In several places in the *ESA News Digest*, mention was made of the ASCE survey, which indicated that 4100 ASCE members believed collective bargaining would be advantageous to them, while only 600 of them actually belonged to a union. ESA does not overlook this opportunity for a moment. They say, "The ESA stands ready to assist these 3500 civil engineers in setting up their own collective bargaining organizations." It cannot be doubted that many of these 3500 are in consulting firms. The ESA will get going on these as soon as they finish up their more pressing work in a few more large industries.

Other Unions

It must be remembered that ESA is not the only union to which engineers can belong. In Chicago, a great many engineers belong to the AFL Plumbers Union. Engineering crewmen on a housing project in California, including three graduate engineers, have just formed a branch of Local 9 of the International Union of Operating Engineers, AFL. CIO also has a number of engineer members. But ESA is the big one, the growing one, the only one that can really call itself a "professional union." It is the one to watch.

What Can Be Done

The first step in halting the trend toward unionism is to recognize that the trend exists. It is necessary that we know the union's story so that it can be faced from a position of strength—not of ignorance. It must also be realized that the non-supervisory engineering employee has more in common with other employees than he does with engineers. He is interested first in his income and in his working conditions. Merely having a degree in engineering does not automatically give him a feeling of being a part of management.

Management's Job

Non-supervisory engineers, then, must be dealt with in much the same way as other non-supervisory employees. The union must be fought in the same way you would fight a trade union trying to set up in a plant. As a part of management it is your job to demonstrate to every prospective union member that he is better off not belonging to a union . . . that his income, his chances for advancement, and his working conditions are better with individual bargaining than with collective bargaining. There is no use wasting time trying to claim than an engineering union "levels salaries" or is "professionally unethical." These appeals are as worthless with engineers as with steamfitters. Face the fact that engineers unions are true unions and that their members are non-supervisory employees interested in their bread and butter first. Ethics has nothing to do with it. ▲▲

Why Canons of Ethics?

Fabian Bachrach

Cp exclusive

By WILLIAM F. RYAN
Vice President and Senior Consulting Engineer,
Stone & Webster Engineering Corporation

Mr. Ryan was graduated from Harvard College, AB, 1911, and Harvard Engineering School, MME, 1913. He received the honorary degree of Doctor of Science from Catholic University of America in 1954. In the same year he received the New England Award for distinguished engineering achievement.

After 16 years' experience in construction, operation, and design of steam power stations and in the design of heavy chemicals plants, Mr. Ryan joined Stone & Webster as Mechanical Engineer, in 1929. He has served subsequently as Assistant Chief Mechanical Engineer, Assistant Engineering Manager, Engineering Manager, and is now Vice President and Senior Consulting Engineer as well as a Director of the Engineering Corporation.

Mr. Ryan invented the "dual circulation" boiler (U.S. Patent No. 1940607). He was a pioneer in the use of high-pressure steam in industrial plants and the utilization of forced circulation boilers. Power generating capacity totaling more than 6,000,000 kw has been designed under his direction.

Mr. Ryan has been active for many years in the engineering societies. He has been a member of The American Society of Mechanical Engineers since 1917, was elected Fellow in 1938, and Honorary Member in 1953. He has served as President and Director of the Massachusetts Society of Professional Engineers, National Director and Vice President of the National Society of Professional Engineers, and as President of the Harvard Engineering Society, New England Section. He presently represents ASME on the Engineers Council for Professional Development, the EJC Labor Panel, and the Joint Committee (ECPD-EJC-NSPE) on the Practice of Engineering.

WHY SHOULD there be a code of ethics for engineers? The Ten Commandments and the Golden Rule apply to all men alike. Why add anything to them for the special guidance of engineers?

The answer to these questions depends on your answer to another question: Is engineering a profession? That question is by no means an academic one. If engineering is a profession, then engineers do need something more than basic rules of human conduct to govern their professional actions.

The attributes of a profession and of a professional practitioner have been carefully defined, and it is firmly established that without an accepted code of ethics there can be no profession. The word "accepted" must be emphasized because the mere formulation of a code means nothing. It must be an accepted code — accepted by the practitioners of the professions, by their clients and employers, and by the general public.

The actual professional status of the engineer is still debatable. There is a group who, by adopting the philosophy of trade unionism, may condemn engineering to the status of a trade or, at most, a technique. There is a much larger group who, by indifference or lack of understanding, retard the emergence of the engineer from the twilight zone — between the craftsman and the scientist — to genuine professional stature. These are the engineers who ask, "Why Canons of Ethics for Engineers?"

Those attributes of a profession that are inherent in the nature of the work and in the normal manner of performing it are possessed in full measure by engineering. The work satisfies an indispensable and beneficial social need; it requires the exercise of discretion and judgment; and it is performed on a high intellectual plane, requiring knowledge and skills acquired through special discipline of education and practice. In these inherent attributes, engineering is quite on a par with medicine or law. To a limited extent engineering has a legal status. No less than doctors or lawyers, engineers assume relations of confidence and accept individual responsibility. A very large number, but it must be confessed that the number is not a majority of the whole group, belong to professional organizations. Efforts are being made by thoughtful leaders to develop a group consciousness commensurate with professional status, to inculcate the personal dedication and service motive that a professional practitioner must possess and, through Canons of Ethics for Engineers, to provide a code of conduct, the acceptance of which will enable engineers to govern their activities in full recognition of their obligations to society and to other practitioners.

Note particularly the matter of "obligations to other practitioners." If there were a genuine recognition of this obligation on the part of employed engineers and on the part of engineers who employ them and direct them, the problems existing in our professional employer-employee relations would

Canons of Ethics for Engineers

FOREWORD

Honesty, justice and courtesy form a moral philosophy which, associated with mutual interest among men, constitutes the foundation of ethics. The engineer should recognize such a standard, not in passive observance, but as a set of dynamic principles guiding his conduct and way of life. It is his duty to practice his profession according to these Canons of Ethics.

As the keystone of professional conduct is integrity, the engineer will discharge his duties with fidelity to the public, his employers and clients, and with fairness and impartiality to all. It is his duty to interest himself in public welfare, and to be ready to apply his special knowledge for the benefit of mankind. He should uphold the honor and dignity of his profession and avoid association with any enterprise of questionable character. In his dealings with fellow engineers he should be fair and tolerant.

PROFESSIONAL LIFE

SECTION 1. The engineer will cooperate in extending the effectiveness of the engineering profession by interchanging information and experience with other engineers and students and by contributing to the work of engineering societies, schools and the scientific and engineering press.

SECTION 2. He will not advertise his work or merit in a self-laudatory manner, and he will avoid all conduct or practice likely to discredit or do injury to the dignity and honor of his profession.

RELATIONS WITH THE PUBLIC

SECTION 3. The engineer will endeavor to extend public knowledge of engineering, and will discourage the spreading of untrue, unfair and exaggerated statements regarding engineering.

SECTION 4. He will have due regard for the safety of life and health of public and employees who may be affected by the work for which he is responsible.

SECTION 5. He will express an opinion only when it is founded on adequate knowledge and honest conviction while he is serving as a witness before a court, commission or other tribunal.

SECTION 6. He will not issue ***ex parte*** statements, criticisms or arguments on matters connected with public policy which are inspired or paid for by private interests, unless he indicates on whose behalf he is making the statement.

SECTION 7. He will refrain from expressing publicly an opinion on an engineering subject unless he is informed as to the facts relating thereto.

RELATIONS WITH CLIENTS AND EMPLOYERS

SECTION 8. The engineer will act in professional matters for each client or employer as a faithful agent or trustee.

SECTION 9. He will act with fairness and justice between his client or employer and the contractor when dealing with contracts.

SECTION 10. He will make his status clear to his client or employer before undertaking an engagement if he may be called upon to decide on the use of inventions, apparatus, or any other thing in which he may have a financial interest.

SECTION 11. He will guard against conditions that are dangerous or threatening to life, limb or property on work for which he is responsible, or if he is not responsible, will promptly call such conditions to the attention of those who are responsible.

SECTION 12. He will present clearly the consequences to be expected from deviations proposed if his engineering judgment is overruled by nontechnical authority in cases where he is responsible for the technical adequacy of engineering work.

SECTION 13. He will engage, or advise his client or employer to engage, and he will cooperate with, other experts and specialists whenever the client's or employer's interests are best served by such service.

SECTION 14. He will disclose no information concerning the business affairs or technical processes of clients or employers without their consent.

SECTION 15. He will not accept compensation, financial or otherwise, from more than one interested party for the same service, or for services pertaining to the same work, without the consent of all interested parties.

SECTION 16. He will not accept commissions or allowances, directly or indirectly from contractors or other parties dealing with his client or employer in connection with work for which he is responsible.

SECTION 17. He will not be financially interested in the bids as or of a contractor on competitive work for which he is employed as an engineer unless he has the consent of his client or employer.

SECTION 18. He will promptly disclose to his client or employer any interest in a business which may compete with or affect the business of his client or employer. He will not allow an interest in any business to affect his decision regarding engineering work for which he is employed, or which he may be called upon to perform.

RELATIONS WITH ENGINEERS

SECTION 19. The engineer will endeavor to protect the engineering profession collectively and individually from misrepresentation and misunderstanding.

SECTION 20. He will take care that credit for engineering work is given to those to whom credit is properly due.

SECTION 21. He will uphold the principle of appropriate and adequate compensation for those engaged in engineering work, including those in subordinate capacities, as being in the public interest and maintaining the standards of the profession.

SECTION 22. He will endeavor to provide opportunity for the professional development and advancement of engineers in his employ.

SECTION 23. He will not directly or indirectly injure the professional reputation, prospects or practice of another engineer. However, if he considers that an engineer is guilty of unethical, illegal or unfair practice, he will present the information to the proper authority for action.

SECTION 24. He will exercise due restraint in criticizing another engineer's work in public, recognizing the fact that the engineering societies and the engineering press provide the proper forum for technical discussions and criticism.

SECTION 25. He will not try to supplant another engineer in a particular employment after becoming aware that definite steps have been taken toward the other's employment.

SECTION 26. He will not compete with another engineer on the basis of charges for work by underbidding, through reducing his normal fees after having been informed of the charges named by the other.

SECTION 27. He will not use the advantages of a salaried position to compete unfairly with another engineer.

SECTION 28. He will not become associated in responsibility for work with engineers who do not conform to ethical practices.

Prepared by Engineers' Council for Professional Development.

evaporate, and the last argument for collective bargaining by engineers would be eliminated.

Since engineering by its very nature possesses many essential attributes of a profession, and since the other attributes are rapidly developing, it may at least be described as an incipient or emerging profession—although it is still ill-organized for the cultivation and promotion of those attributes that are not yet fully developed. In the matter of ethics, engineers have reached the stage of formulating a code. Canons of Ethics for Engineers has been formally adopted by every major engineering society in the United States and Canada. Acceptance is another matter. The engineers themselves have hardly accepted the Canons in the full sense of the word. It is little wonder, therefore, that the general public is not aware of its existence.

Medicine and Law

Few laymen have read the Canons of Ethics of the American Bar Association or the Code of Ethics of the American Medical Association. Yet, every intelligent American knows these codes, in principle.

If a stranger thrusts his card into your hand announcing that he is an attorney and counsellor-at-law while you are picking yourself up after being struck by an automobile, you are not at all likely to engage him to bring suit against the careless driver. Why? The enterprising gentleman violated none of the Ten Commandments. According to his rights, he may have been practicing the Golden Rule. The Good Samaritan himself, had he been a lawyer, might have offered legal assistance to the man who fell among thieves. The reason you would not engage him is that you know that lawyers have a code of ethics that reputable lawyers observe. Moreover, you know that the untimely offer of legal aid was a violation of that code. In short, you identify the man as a "shyster," an "ambulance chaser."

If you have a painful disease and read an advertisement announcing that Dr. Blank has an infallible cure for it, you do not make haste to call on Dr. Blank. Your knowledge of the Code of Ethics of the American Medical Association is sufficient to enable you to identify Dr. Blank as a "quack." Suppose you had a sudden pain in a strange city, saw a doctor's shingle, rang his bell, received his advice, and at the end of the interview he charged you fifty cents. You would be afraid to get his prescription filled. Why? The doctor may be an altruistic soul, practicing his version of the Golden Rule. The Good Samaritan made no charge at all for his medical assistance. However, none of these considerations would allay your suspicions. You know enough about the Code of Ethics governing reputable doctors with respect to compensation to realize that the fifty cent fee is not adequate for competent medical advice.

Engineers also "uphold the principle of appropriate and adequate compensation for those engaged in engineering work" (Canons, Sec. 21), yet most laymen feel that they have struck a good bargain when they engage an engineer for a fee or a salary that is no more "appropriate and adequate" than the fifty cents would be for medical attention. To establish engineering as a profession, reputable and competent engineers must adhere so scrupulously to the ethical principle of "adequate and appropriate compensation" that whoever offers to accept an inadequate or unappropriate fee or salary is immediately discredited in the eyes of a prospective client or employer.

Competitive Bidding

Conceive, if you can, an invitation for bids on medical or surgical services. No one is so ill informed regarding the AMA Code of Ethics that he would expect a proposal from any reputable physician or surgeon. Yet competitive bids for engineering services are requested frequently, not only by county boards and state commissions, but by privately owned industrial organizations. Moreover, they get them. It cannot be flatly stated that competitive bidders are not reputable engineers; it can only be said that the American Society of Civil Engineers, last year, expelled one member and suspended thirteen others for having been guilty of that unethical practice.*

The engineers disciplined by ASCE were widely scattered, geographically. The incident proves that many engineers refuse to be governed by the ethics of what they call their "profession." In the absence of such acceptance, one can hardly expect recognition by prospective clients or employers. The action of ASCE was courageous, and it is hoped that the example of that society will be followed by other professional organizations. However, the incident also points up the fundamental weakness of the professional organization of engineers. Expulsion from ASCE for violation of its code of ethics is not a disaster comparable to expulsion from the American Medical Association for a comparable reason. The reason is that the AMA code is accepted by the entire medical profession, even by the relatively few practitioners who are not members. In the eyes of hospital trustees, and in the eyes of an individual patient, a violation of the medical code is an extremely serious matter. Engineers have no organization whose general approval is essential to the maintenance of good professional repute. A very large number of engineers belong to no professional organization whatever and, therefore, have not subscribed, even by indirection, to Canons of Ethics for Engineers, or to any other, unless they happen to have been registered in some state where acceptance of a code of ethics is required for professional licensure.

In the struggle to become a profession, engineer-

*See *Civil Engineering*, P. 77, March 1954; p. 73, June 1954; and p. 78, September 1954

Canons of Ethics for Engineers

CONSULTING ENGINEER has reprinted the "Canons of Ethics for Engineers" appearing on page 41. The reprint is on a good quality, parchment paper stock, suitable for framing. The Editors will be glad to mail you a copy at cost — twenty-five cents. Address: CONSULTING ENGINEER, 420 Main St., St. Joseph, Michigan.

ing has accomplished a great deal. It has raised the standards of technical education to ensure adequate intellectual attainments of future practitioners; it has fostered the engineering arts and sciences through a multiplicity of active organizations; it has achieved a legal status in all 48 states; and it has formulated a code of ethics. Many things remain to be done, of which none is more urgent than the acceptance by engineers themselves of the profession's legal status and its code of ethics.

If one agrees that a code of ethics is indispensable to professional status, it may still be asked "Why Canons of Ethics for Engineers?" Couldn't there be some shorter code, something more specific? Certainly it could be shorter and more specific, but it should be realized that a code for engineers must cover a wide field, men in every branch of engineering, young and old, experienced and inexperienced, employees, supervisors, managers, and owners and partners in engineering firms. Moreover, the code, as it stands, was developed by years of patient effort involving adjustments and compromises. That, also, is due to the lack of any existing strong professional organization.

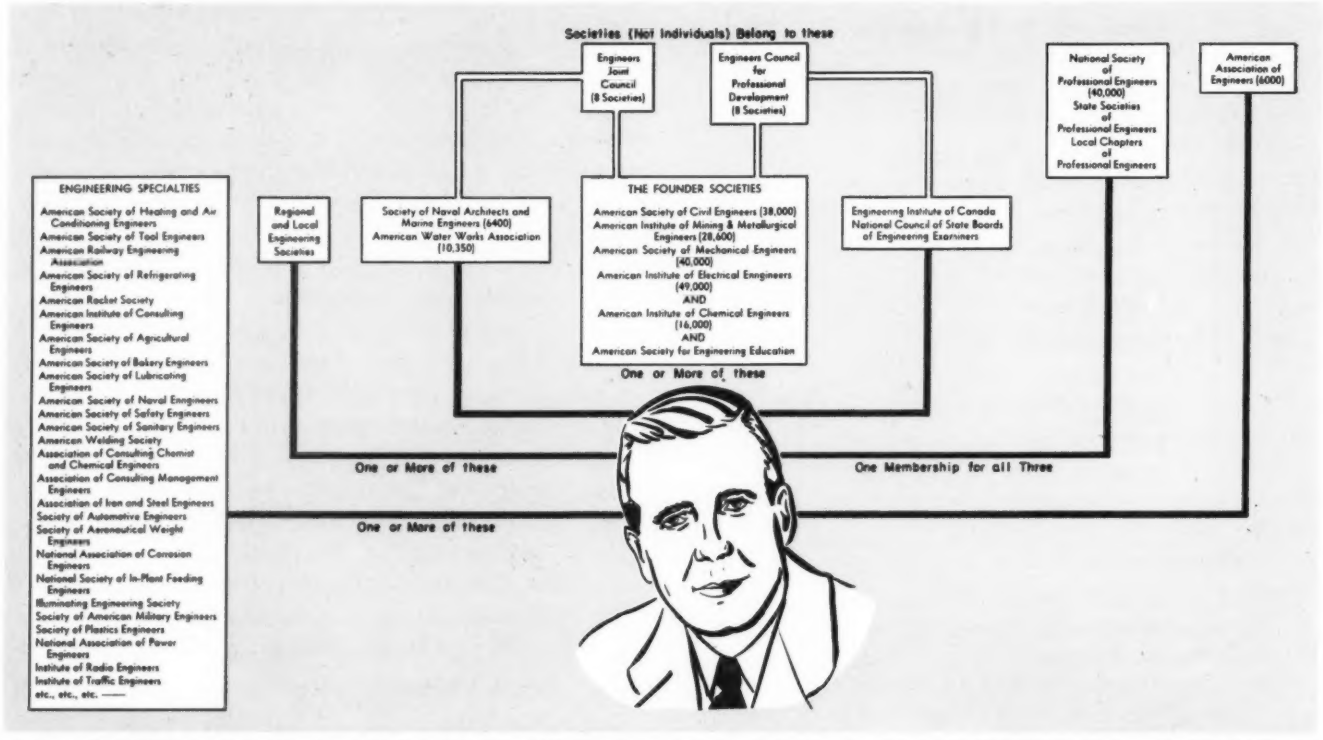
At least ten different societies were concerned in the drafting of the Canons, during a period of 17 years. Prior to 1947, when Canons of Ethics for Engineers was finally adopted by Engineers Council for Professional Development and ratified by the required two-thirds of the eight constituent societies of ECPD, at least 38 American and Canadian engineering societies had their individual codes of ethics. These codes varied widely in form and content and these differences had to be reconciled before any general acceptance of a new code could be expected. The final achievement of a code that all important engineering societies would accept is due to the wisdom, patience, and persistence of the late Dr. Dugald C. Jackson, whose entire life was devoted to the elevation of his calling to the rank of a recognized and accepted profession.

No acceptable code of ethics can be considered static. Some problems of professional conduct, such as unionization, corporate practice, and competitive bidding have become more acute since the adoption of the Canons in 1947. Any one of the 80 societies that have adopted the Canons may move for their amendment by additions, deletions, or alterations in wording. A careful study of the Canons, however, will show that they establish rules of conduct that would eliminate most of the disabilities from which engineers suffer in their quest for meaningful professional recognition.

Education in Ethics

The understanding and acceptance of professional responsibilities is not readily acquired late in life. From his first day in medical school, a candidate for the practice of medicine is indoctrinated with a professional concept of his work. Dedication to the public service, group solidarity, and strict observance of his code of ethics are as much a part of his education as anatomy. There is a heartening movement among engineering educators, feeble perhaps but earnest, to adopt a comparable program for engineering schools. Included in this program is a general distribution of Canons of Ethics for Engineers among the students. A serious and intensive discussion of the Canons at meetings of the American Society for Engineering Education is also proposed; acceptance of a rule of conduct by students can hardly be expected if the rule is not understood and observed by their teachers. The Canons can provide a central theme for the professional indoctrination of embryo engineers, resulting in a more rapid development of those professional attributes in which engineering is still weak.

The adoption of the Canons by all important professional engineering societies in the United States and Canada signalizes the document as the one element of professional unity which engineers are striving so hard to achieve with such little success. Officially, through their engineering societies, engineers have agreed on something — something of vital importance. There remains to be achieved a genuine acceptance of the code by individual practitioners. This will be followed, inevitably, by acceptance on the part of employers, clients, and the general public. Then we shall no longer question: "Why Canons of Ethics for Engineers?" ▲▲


Societies (Not Individuals) Belong to these
Engineers Joint Council (8 Societies)
Engineers Council for Professional Development (8 Societies)
National Society of Professional Engineers (40,000) State Societies of Professional Engineers Local Chapters of Professional Engineers
American Association of Engineers (6000)
ENGINEERING SPECIALTIES
American Society of Heating and Air Conditioning Engineers
American Society of Tool Engineers
American Railway Engineering Association
American Society of Refrigerating Engineers
American Rocket Society
American Institute of Consulting Engineers
American Society of Agricultural Engineers
American Society of Bakery Engineers
American Society of Lubricating Engineers
American Society of Naval Engineers
American Society of Safety Engineers
American Society of Sanitary Engineers
American Welding Society
Association of Consulting Chemist and Chemical Engineers
Association of Consulting Management Engineers
Association of Iron and Steel Engineers
Society of Automotive Engineers
Society of Aeronautical Weight Engineers
National Association of Corrosion Engineers
National Society of In-Plant Feeding Engineers
Illuminating Engineering Society
Society of American Military Engineers
Society of Plastics Engineers
National Association of Power Engineers
Institute of Radio Engineers
Institute of Traffic Engineers
etc., etc., etc. ——
Regional and Local Engineering Societies
Society of Naval Architects and Marine Engineers (6400)
American Water Works Association (10,350)
THE FOUNDER SOCIETIES
American Society of Civil Engineers (38,000)
American Institute of Mining & Metallurgical Engineers (28,600)
American Society of Mechanical Engineers (40,000)
American Institute of Electrical Engineers (49,000)
AND
American Institute of Chemical Engineers (16,000)
AND
American Society for Engineering Education
One or More of these
Engineering Institute of Canada
National Council of State Boards of Engineering Examiners
One or More of these
One Membership for all Three
One or More of these

THE ENGINEER CAN FIND NO SINGLE GROUP TO REPRESENT HIM TO SOCIETY. RATHER, HE MUST SHOP AMONG DOZENS.

You've Got To Be a Joiner

CE exclusive

STAFF REPORT

THE GENERALLY held opinion that engineers are introverts must be based on something other than their record as members of engineering organizations. Engineers can claim undisputed championship as the most vigorous joiners in both the professional and the nonprofessional leagues. This title is not one sought after. It was forced by a series of circumstances. There are now so many engineering societies that a good engineer working in a fairly broad field could logically belong to 15 or 20.

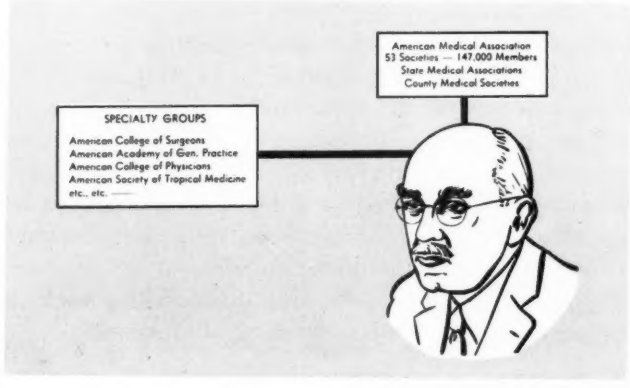
Most engineers feel that it is necessary to belong to the Founder Society most representative of their educational background or their principal field of activity. It is not at all unusual to belong to two or even three. The trend is toward making it easier to belong to more than one. For example, just this past year the American Society of Mechanical Engineers and the American Institute of Electrical Engineers reached an agreement whereby a member of one group could join the other without payment of an entrance fee. "This step was taken," as Mr. Lewis K. Silcox, past-president of ASME says, "for the convenience of all our members in recognition of the fact that many of them have overlapping interest in both mechanical and electrical engineering."

While this touching of finger tips by ASME and AIEE is good, it can hardly be called a step forward. It is more like a step sideways. But it is good to be able to move at all. This slight effort toward unity (if it can be called such) is toward a type of unity for which there is no need. Unity of engineering societies is needed at the top — in an organization representing engineers as a whole — not in the joining together of one or more of the technical groups.

A Comparison

To understand the problem of society unity, it is only necessary to look, in the adjoining columns, at two charts—one showing the engineering societies and their relationship one to one another, and one showing the medical societies in the United States. The Founder Societies are technical organizations representing particular engineering specialties. They are comparable to such groups as The American Col-

lege of Surgeons, the American Academy of General Practice, and the American College of Physicians. The pardoning of entrance fees for each other's members within this block of technical societies is certainly not objectionable, but it must be recognized that it is not in this region that society unity is needed. Each of these groups, just as the specialty groups in medicine, deal with some technical field of activity, and there is every reason for them to function separately from each other. It is only logical that engineers should maintain societies in their separate fields of activity — civil, mining, mechanical, electrical, or chemical. Whether these technical societies recognize each others members, eliminate entrance fees for mutual members, or invite each other to



THE MEDICAL MEN HAVE A SINGLE SOCIETY OFFERING A UNIFIED VOICE, PLUS LIMITED SPECIALTY GROUPS.

joint cocktail parties is of little moment. These things have little to do with engineering unity so long as there is no one organization for engineers that is the equivalent of the American Medical Association.

The Contenders

There are two major and one minor contenders for the job of being sole representative for engineers as a whole. These are the Engineers Joint Council, The National Society of Professional Engineers, and The American Association of Engineers. It is possible that the first two are on the verge of a major contest — winner take almost all — with The American Association of Engineers running a rather poor third. Top men in both EJC and NSPE, however, deny that there will be any contest. They claim a firm truce, but it looks more like the lull before the storm. The truth is that even if the top organization men are in favor of a permanent truce, such a peace is not their's to give. The individual engineers in this country are in favor of having one central organization representing them as a profession, and this fire at the grass roots will keep smoldering until action is taken.

First, consider the current status of the Engineers Joint Council. This is an organization made up of eight engineering societies, including the Founder Societies. It represents about 270,000 engineers. But the word "represents" must be taken in its broadest sense. Actually, no individual engineer can belong to EJC. Only the eight societies are members, so EJC can claim a membership today of only eight rather than 270,000. For an engineer to get his personal ideas through to the functioning heads of EJC would be supremely difficult.

Second, there is the National Society of Professional Engineers. Here the problem is quite different. NSPE is set up in much the same way as the American Medical Association. That is, when an individual engineer becomes a member of a local section of the professional engineers, he also becomes a member of his State Society of Professional Engineers and the National Society of Professional Engineers. He does have a voice in the operation of the whole organization from local to national—so far as representative government permits. The trouble here is that NSPE will accept for membership only registered engineers. No matter how highly one may regard registration, it must be admitted than an organization representing only those engineers who are registered is hardly representative of the engineering profession as a whole. The total membership of NSPE is only 40,000. That is less than 10 percent of the graduate engineers in the country.

The American Association of Engineers is considerably smaller. It has a membership of about 6000. Perhaps its "lodge" and "fraternal" aspects — it offers its members life and health insurance and an employment service — have done much to keep it from growing and becoming the representative or-

THOUGH THERE ARE THREE PEGS ON WHICH UNITY OF THE PROFESSION COULD HANG, NONE YET APPEAR TO FIT.

ganization for professional engineers. Its membership is too small for it to be considered a major contender in any sense.

Why does it seem that a fight is in the offing between EJC and NSPE? The main reason is that EJC is beginning to show some signs of life. On July 8, 1954, EJC made two changes in its constitution. One change permits organizations with less than 5000 members to become Associates in EJC; the second admits as Affiliates those engineering societies that are regional rather than national in scope. These are important amendments. They indicate that the EJC is about to expand — perhaps rapidly. A third and even more important amendment was tabled for further study. This amendment would change EJC from a confederation of societies into a unity group with individual membership. In other words, had this change been accomplished, an engineer who is a member of one of the Societies within EJC might become a member of EJC himself. This would make Engineers Joint Council into *the* unity engineering society — a society that could claim the greatest membership of any engineering group. But the amendment did not pass; it was tabled. It will be worked over and brought up again this year.

If Engineers Joint Council were reorganized to permit individual membership, it could certainly count on a total of at least 100,000 members. It would then be more than twice the size of NSPE. Despite all protestation to the contrary, NSPE would not like this. To meet the challenge they would have to make some provisions for membership of non-registered engineers — or they would have to accept a position on the second step down, letting EJC represent all engineers, while NSPE represented just one smaller group, the registered engineers. NSPE does not heartily favor either alternative.

Consulting Engineers

Of particular importance to consultants is a growing effort to organize a National Society of Consulting Engineers. There is already in existence an old and respected organization set up for this purpose. The American Institute of Consulting Engineers has offices in the Engineers Building in New York, and it has done a good job within its self-imposed limits. It has less than 300 members, so it could hardly be called a representative organization. It has no local chapters; it does meet at a luncheon once a month in New York.

Recognizing that as it now operates the AICE is not a "National" group, there have been several efforts to organize another society for consultants. A group in Philadelphia recently formed the American Society of Consultants. Also, the Texas, Oklahoma, Washington, and Minnesota Societies of Consulting Engineers have been carrying on some correspondence aimed at the formation of a National Society of Consultants. The conclusion is that there is need for the American Institute of Consulting Engineers to expand their activities and their membership or expect the formation of another society that might well dominate activities in the consulting profession so far as societies are concerned. It would seem wise to operate within the structure of a society already in existence, if possible, rather than add to the growing maze of competing and overlapping organizations. However, in order for this to be done, the American Institute of Consulting Engineers must considerably broaden its field of activities and extend its membership, both geographically and through the various legitimate levels of the consulting profession.

The Year Ahead

Looking into 1955, it seems that this will be a year that might see some real action from Engineers Joint Council toward the formation of a truly representative organization for all engineers. There is the further likelihood of the beginning of a real fight between EJC and NSPE. The results, regardless of who wins, loses or draws, will be a movement toward formation of a unity society representing all engineers in the country.

On the other hand, the picture within the consulting group is one indicative of division. If the American Institute of Consulting Engineers does not grab the ball soon, their fumble will be recovered by some other group organizing the consultants. ▲▲

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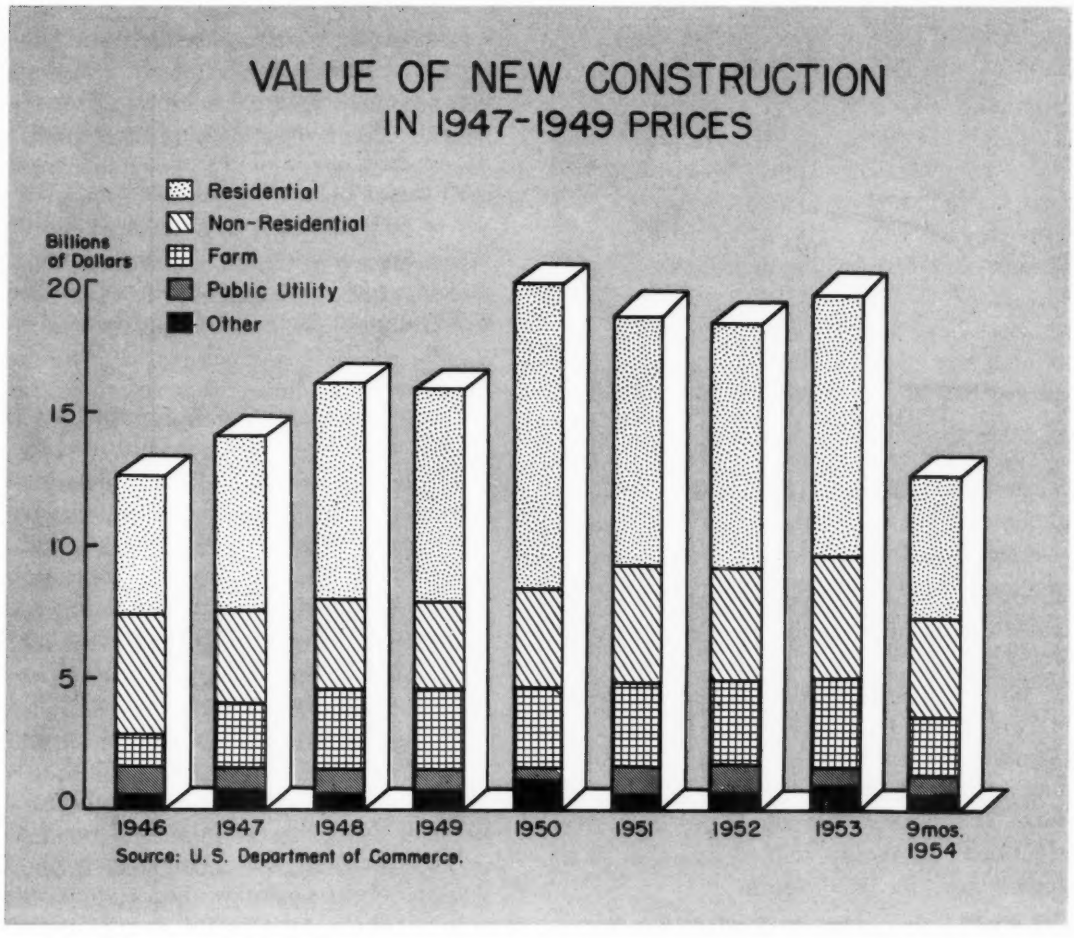
quotes --

In this country we have about 500,000 engineers and 200,000 scientists. It is reported that corresponding figures for Russia are 400,000 and 150,000. While we presently have a greater number, the U. S. S. R. is increasing its supply at a more rapid rate. . . . It has been stated that at least 25 percent of the engineers in Russia are women. In the United States they would constitute only a fraction of one percent.

Our government and defense officials are becoming concerned about the serious situation in our supply of engineers and scientists. Accordingly, President Eisenhower has appointed a special cabinet committee to study the matter. . . . This action is necessary and, in fact, overdue. . . .

John T. Rettaliata, President
Illinois Institute of Technology



The Economic Outlook - 1955

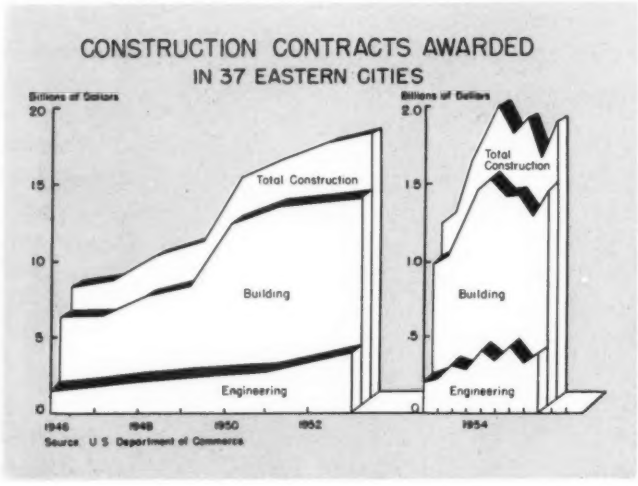
E. F. MAC DONALD
Industrial Economist

CE exclusive

Mr. Mac Donald is a professional economist who's daily work is the analysis of statistics to determine what is happening to our nation's economy and what will happen in the months ahead. As a regular contributor to CONSULTING ENGINEER, ("Economic News Notes") he takes a particular interest in the economic outlook for engineers in private practice. He claims that he is right in his forecast just about as often as the Weather Bureau, even though they use more complicated instruments.

IF ANY MEDALS are going to be handed out for 1954, construction ought to get a big, shiny one. There's no doubt that construction was one of the "Heroes of the Year." Instead of the mild downward trend that was anticipated as an accompaniment or component of the 1953-54 Recession, construction activity thumbed its nose at "old-fashioned" business cycle theory and got bigger and better as the year went on. In fact, all-time highs were recorded in the volume of construction put in place as well as in the dollar total for building and engineering contract awards during the year.

The original joint forecast by the Departments of Commerce and Labor for 1954 looked for outlays for new construction of about $34 billion, slightly under the record total for 1953. Last June the estimate was revised upward to $36 billion. In October the revision was again revised—upward. On the basis of the



first nine months of 1954, it appeared that construction was headed for a new record-high in the neighborhood of $37 billion.

A similar story developed with respect to contract awards. In November 1953, the F. W. Dodge Corporation estimated that total building and engineering contracts let in 1954 would lag 3 percent behind the 1953 total. It is likely that when the final 1954 figures are totaled, the results will be as much as 10 percent greater than the 1953 volume.

And while we're handing out medals, strike an extra-fancy one for residential building. It was the principal nonconformer to the forecasts of the experts. At the outset of 1954, an estimate bandied about with considerable agreement was that residential building would fall off about 10 percent. The only thing wrong with that guestimate was the direction—the 10 percent should have been upward rather than downward.

When the construction-multiplier nature of residential building is considered — the impact on roads, schools, water and sewerage, and shopping centers, for example — the importance to the entire construction industry of accurately gauging the potential demand for new homes is readily apparent. Perhaps one of the more common mistakes of business analysts during the last few years has been underestimating the basic strength of the economy and its major components. Certainly the size of the effective demand for better housing was misjudged at the outset of 1954. The early postwar demand was for housing—plain and simple—lots of it and in a hurry. By 1954 it was obvious that there had been a big change in the nature of housing demand. Minimum requirements had been fairly well satisfied, and people were now raising their sights and looking for homes with an extra bedroom and bathroom and located in a more desirable suburban development. Not only looking, but buying—and why not? Personal incomes were higher than ever before; substantial funds of liquid assets were widely distributed among the public; mortgage money was readily available on easier terms; and millions of vets were still eligible for GI home-loan benefits. We must not overlook the baby boom — those blessed babies that have changed family housing needs materially and have been a dominant factor behind the demand for such a wide variety of goods and services. Just as the increasing demand for automobiles was one of the principal dynamic forces of the Twenties, so has the baby boom been a potent factor in the postwar economy.

Industrial Building Down

Although complete data for 1954 are not yet available, it looks as though expenditures for nonresidential building wound up 9 to 10 percent ahead of the preceding year. Industrial building, one of the most important components, declined around 10 to 11 percent, but in neither actual outlays nor in contract awards did the declines run as badly as anticipated at the outset of the year. Both private and public construction of industrial facilities fell off and at approximately equal rates. Commercial building — warehouses, office buildings, stores, and the like — showed a substantial gain over 1953, as did expenditures for other nonresidential building such as educational, religious, hospital, and recreational.

Farm construction, which accounts for a larger volume of expenditures than is generally realized — over a billion and a half dollars last year—was probably as much as 10 percent under 1953. Among private utilities, the decline in outlays for railroad construction was a little more than offset by the gains in new construction by gas and electric utilities and telephone and telegraph companies.

Public Construction

Total public outlays for construction in 1954 were little changed from the preceding year. Reduced spending occurred for housing, industrial facilities, conservation and development, and for military installations. These declines were offset in the aggregate by increased spending for educational buildings, highways, and water and sewerage projects. Taking up the slack occasioned by reduced Federal expenditures for construction, state and local spending rose to an all-time high. As indicated in the accompanying chart, the steady increase in highway construction by state and local governments since the end of World War II continued unabated in 1954.

Since rising outlays by states and municipalities were one of the principal factors in raising construction volume to a record level last year, it is interesting to note that they are of less importance relatively in the economy than they were prior to World War II. Despite an increase during 1954, state and local spending accounted for less than 8 percent of the total output of goods and services by the economy. In 1939, it provided a market for 9 percent of the total production in the nation. Unless there should

be a sudden and sharp turnabout in Federal spending, state and local outlays for construction and other purposes may shortly surpass the high point of their relative importance in the economy reached during the Great Depression.

Few "Go-Slow" Signs

One of the more surprising aspects of the construction boom at the close of 1954 was the relatively few claims made that this or that sector of construction activity was about to fall on its face. Usually, after a boom has been in progress for some time, analyses begin to appear purporting to show that certain areas of weakness have been discovered and that, therefore, the days of the boom are numbered. In the flood of forecasts that appeared as usual at year-end, however, there was a conspicuous absence of alleged cracks in the construction picture.

A few cases were mentioned as possible forerunners of trouble. For example, the failure of the big shopping center, "Shoppers World," at Framingham, Massachusetts, after three years of operation and with a loss of 30 percent on its original cost, was cited as a possible "stop, look and listen" signal. Could be. As special-purpose construction, shopping centers merit careful checking. Undoubtedly, there are now many communities where the number of shopping centers is sufficient for present needs and for some time ahead.

Reports from an increasing number of cities indicate that the supply of office space has more than caught up with the demand. Rising vacancy ratios and easing rents are signs that the expansion of outlays for office buildings will probably slow down.

Another example that has been mentioned as a possible harbinger of unfavorable developments in a special field of construction was a decline in toll revenue taken in by the Pennsylvania Turnpike. It was pointed out that a drop in truck traffic resulted in toll receipts in the first seven months of 1954 amounting to 5 percent less than a year earlier. Such a decline in fares might have carried more weight as a warning sign had it been associated with a turnpike that could not boast of having met its debt payments six years ahead of schedule.

More than likely, though, here is an area of construction that might be overbuilt in the construction of a number of toll turnpikes through regions in which the traffic will not be sufficient to carry the indebtedness of the roads. This will not, however, deter an increasing volume of turnpike construction —although it may very well have a rather sharp impact for a time on the cost of borrowing funds for this purpose.

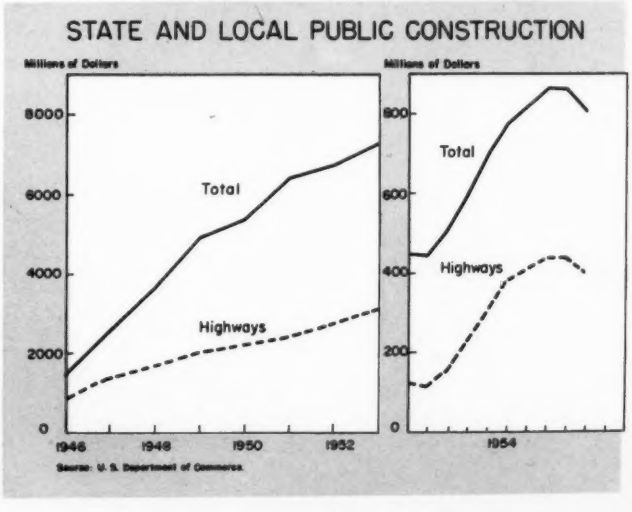
Right now there is an imposing list of turnpike projects that are past the idea stage and moving toward the stages of bond financing and requests for construction bids. Authorized toll road and toll bridge projects at the close of 1954 totaled an estimated $1.5 billion; the bulk of these projects are scheduled to be under construction this year.

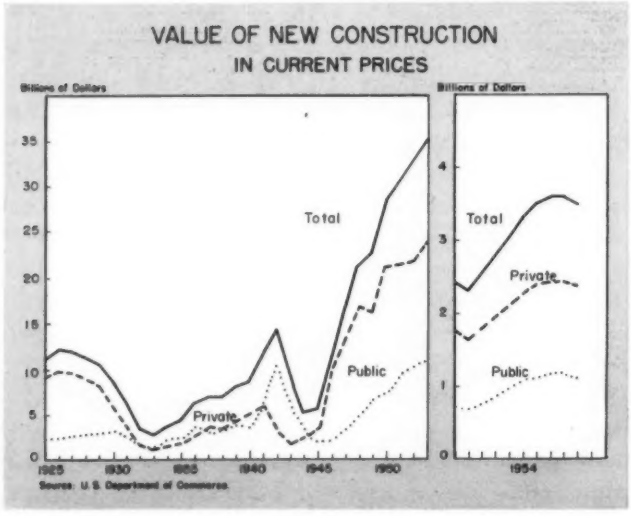
It is natural that the current construction boom be compared to its prototype of the Twenties. The main question raised has been whether, as was true then, present activity is leading to an excessive amount of construction. The comparison between the two situations was considered recently by Dr. G. C. Smith, economist for F. W. Dodge Corporation. He found that after adjusting total construction outlays in 1954 for changes in costs and population, they were only half as large, per capita, as they were in 1927. And outlays for new construction in 1927 accounted for 15 percent of total spending by business, individuals, and government. But last year the comparable percentage was only about 10 percent. Measured in terms of the dollar-size of the economy last year, an extra 5 percent would mean an increase of $16 billion in construction business. It has been pointed out, however, that such comparisons do not take into account cost-cutting construction factors such as more efficient factory lay-out (whereby less space is needed for a given volume of production) and improved building methods. It was concluded that the present boom has not yet peaked, that there may be over-building in some categories of construction, and that caution would not be amiss on the part of both builders and investors.

Bright Green Light

If analysts profess to find a happy paucity of "go-slow" signs, they have no trouble in citing factors and developments that should continue the high levels of construction for some time to come. The effect of many of these will be experienced more over the long-run than in the immediate future. However, the record levels of new contract awards in recent months assure plenty of construction business in the months directly ahead.

In setting up the goal of a $500 billion economy





within a decade, the Administration estimated that over $200 billion would have to be spent for public works to meet the needs of the expanded economy. That would be double the current rate of outlays for such purposes. To achieve such growth President Eisenhower has recommended a highway program that would require an additional $5 billion to be spent on highways each year—twice the present rate of spending by Federal, state, and local governments. He recommended also that the $2.5 billion now being spent annually on schools and colleges be boosted to $6.5 billion, that $1 billion be added to the current outlay of $600 million on hospital construction, and that almost $2 billion more be added to expenditures for water and sewer systems now amounting to a little over $1 billion.

Grandiose plans? Well, there's no doubt that the figures are impressive, but there is more to it than a mere boastful program for political purposes. There is a very practical basis for the whole program—present needs and measurable future needs. If the program materializes, it will be the biggest thing in the history of the construction industry. Few industries have ever had an outlook as promising.

One of the principal steps taken by the Administration last year to create an economic milieu favorable to private investment in plant and equipment was the new tax provision for taking more rapid depreciation on capital assets. For the past two years, private construction of industrial facilities has been declining, and although the new tax provisions are not likely to reverse the trend this year, they will be a factor in moderating the decline. It might be noted also that another tax change favorable to capital investment in plant and equipment is the provision whereby research and experimentation costs may, at the option of the taxpayer, be treated as deductible expenses in the taxable year or capitalized and amortized over a five-year period.

The 1954 revisions of the tax code did not go as far as many businessmen hoped they would in liberalizing depreciation allowances, but they took an important step in the right direction. Depreciation reserves will be the source of an increasingly large amount of funds for construction in view of accelerated depreciation of defense plants and the higher rate of depreciation allowed by the new tax law.

A Neat 6 Percent

All of which sounds as though the construction industry were on the threshold of the greatest boom in its history. It is—according to a number of experts, even though there can be many a slip between the plan and the cornerstone.

The F. W. Dodge Corporation looks for a 6 percent dollar volume increase for total building and engineering contracts in the 37 eastern states, and a 5 percent gain in total new residential and nonresidential building floor space. This authority estimates a substantial gain (12 percent) in educational buildings, and moderate increase (3 to 9 percent) in commercial structures, hospitals, public buildings, and religious and recreational facilities. The only building classification for which a decline is estimated is manufacturing, and the 5 percent drop might be erased if actual improvement in business matches business confidence. The dollar volume of public works and utilities contracts is expected to be 11 percent greater than the 1954 figure. It is pointed out that an important factor in this rise will be highway construction—an enlarged program for which is already underway in anticipation of the President's highway recommendations. Dodge points out that "these conservative estimates . . . if approximately realized, would represent only a small fraction of the nation's potential long-range construction market."

And a Not-Gaudy 7 Percent

The Departments of Commerce and Labor put their heads together and announced that they expect new construction activity to reach an all-time high of $39.5 billion in 1955, 7 percent above the record-breaking $37 billion bill in 1954. They look for both private and public construction to set new records this year, with private outlays estimated to rise to $27.4 billion and public spending to $12.1 billion.

Residential building is expected to increase by 13 percent and to account for 55 percent of all private construction in 1955. Commercial construction will continue to expand to a new high of $2.3 billion of work put in place, with the emphasis on new stores, shopping centers, and offices to service new housing developments and continued suburban growth. Religious and private educational building, both of which set records last year, will likely expand still more this year. Public utility expansion as a whole will remain close to the peak levels of 1953 and 1954. Some decline in rail and gas utility construction will be offset by moderate gains in petroleum pipeline

construction and electric plant expansion. New industrial construction will lag behind 1954, declining moderately for the third successive year, since the major part of the huge defense plant expansion begun after 1950 has been put in place. Noting that the downturn in contracts awarded for industrial building was leveling off in late 1954, the Joint Agency Report estimates that the rate of decline in work put in place this year will be less than in 1954.

The anticipated increase in public construction activity this year reflects continued expansion for nearly all types of state and local public works. The two Federal agencies look for highway construction to reach a new high of $4.2 billion—nearly 20 percent above 1954's level. Public school building will continue its swift pace through 1955. It will require a 16 percent increase in outlays to provide new facilities to replace obsolete quarters and to provide additional classrooms for enrollment gains averaging nearly 1.5 million pupils a year. As in the private sector, the principal decline will be for industrial building, particularly for construction of atomic energy plants. Construction work at military bases, following a 29-percent drop last year, is slated for a rise of almost 20 percent.

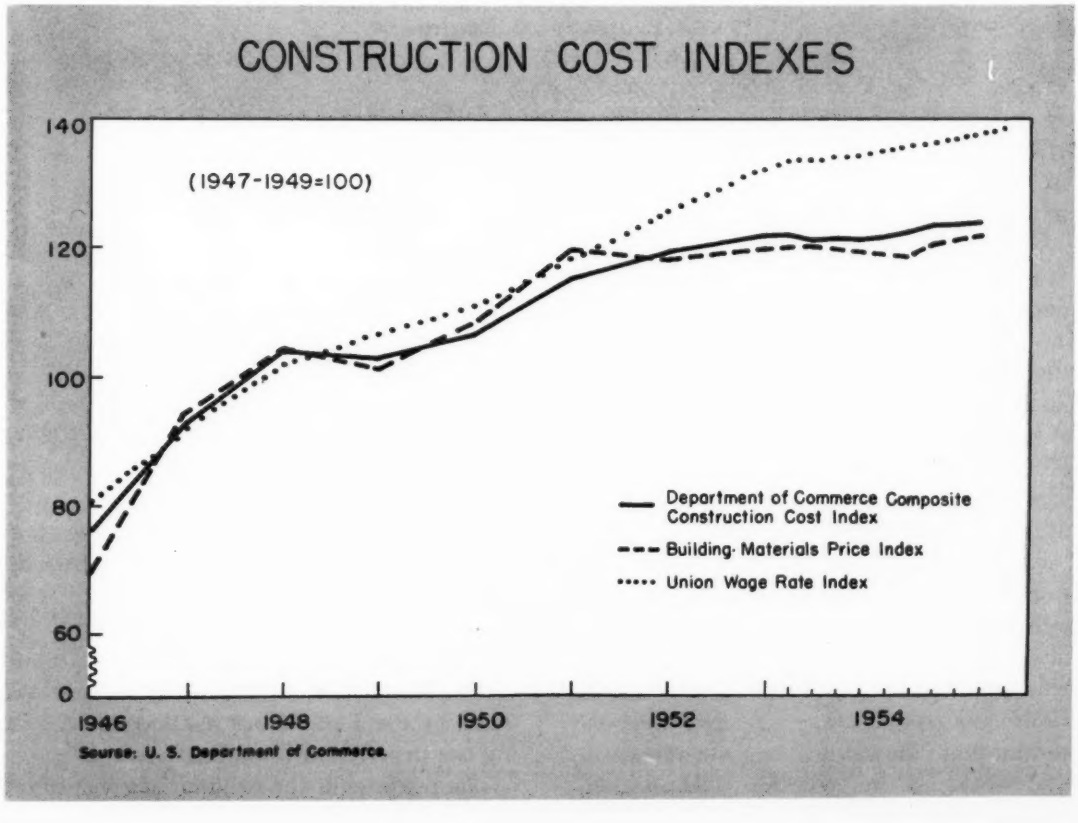
Ordinarily, it is difficult enough to estimate what is going to happen next year, much less 10 years from now. Yet it seems that there is much more confidence that construction activity will expand substantially over the next decade than there is that it will continue to boom all the way through this year. Dr. H. E. Luedicke, editor of the *Journal of Commerce,* expresses it this way: "What we don't know as yet —and this is all-important—is how the long-range confidence will affect short-term swings." He cites as an example, residential building: "Obviously, it is squared away for another good year. The question is whether the current rate, sharply stimulated by the artificial stimulants in the new Housing Act, can be maintained until the long-range population and family formation trends can catch up. . ."

There seem to creep into more and more discussions of the future, references to expansion of economic activity based mainly on the mere fact of population growth. The implication seems to be that rapid population growth is, by itself a built-in automatic expander of economic activity, incomes, and well-being. Unfortunately, there are a number of necessary ingredients before needs created by an expanding population are finally satisfied.

Solid Basis

There's no doubt that a solid basis exists for the growth of construction activity. But there is no guarantee that the needs will be satisfied without interims of interruption.

For the most part, however, such qualms (the hallmark of the economist) are not shared by the average businessman. He's had a lot of confidence in the business outlook right along — and, as it has turned out, he has not been far wrong. If, as President Eisenhower remarked recently, "the state of our economy is largely a national state of mind," 1955 has started off in good shape. ▲▲



IN 1943, ONLY 100 ENGINEERS WERE ADMITTED TO PRACTICE IN CALIFORNIA. IN 1953, THERE WERE 3178 APPLICATIONS AND 1646 REGISTRATIONS GRANTED. IN 1954 THERE WERE 5056 APPLICATIONS.

California, Here We Come!

ASA G. PROCTOR
President, California Board of Registration For Civil and Professional Engineers

CE exclusive

HUNDREDS OF ENGINEERS are coming to California each year from other states, and they seek registration here at the earliest possible moment. It is the Engineering Registration Board's responsibility to determine the competency of these engineers and to make sure that they have the proper understanding, not only of the basics of general engineering but of those principles of design applicable particularly to California.

Because of the tremendous construction program that is under way or contemplated in California, there is an ever-increasing demand for the services of competent engineers. Engineers of all ages and degrees of competency are flocking here from every state. While it is possible to obtain registration in many states through reciprocity with another state, the California law does not include any provisions for reciprocal registration. Therefore, all applicants for California registration are required to take an examination. However, registration in another state, obtained by written examination, generally entitles the applicant to an individual examination before the California Board.

Mr. Proctor is a civil engineer, educated at Stanford University. He is one of those rare persons, a real native Californian. A member of Tau Beta Pi, a life member of the American Society of Civil Engineers, Proctor has been a member of the California State Board of Registration for Civil and Professional Engineers since January 1933.

Registered as a "Structural Engineer," he practices as a civil engineering consultant. He has served as a consultant for several cities in California as well as Reclamation and Sanitary Districts.

The Registration Law

Engineering registration, as it was made into law in the State of California, was a regulatory enactment by the Legislature as, and is, "An act regulating the practice of Civil Engineering."

The purpose of the original act was to regulate the

practice of Civil Engineering "in order to safeguard life, health, property, and public welfare." It was further provided that beginning 12 months after the Act became effective it would be unlawful for any person to practice or offer to practice Civil Engineering in the State of California unless such person had been duly registered or specifically exempted as required by the provisions of the Act.

A Board of three members was appointed by the Governor, and they proceeded with the business of adopting minimum requirements for registration under the "Grandfather Clause," and specific requirements for registration by examination thereafter. The 1947 Legislature enacted amendments to the original Act and included permissible registration in the branches of Electrical, Mechanical, Chemical, and Petroleum Engineering. The Board was increased to seven members — one additional member to direct the administration of each of the four branches brought under the Act.

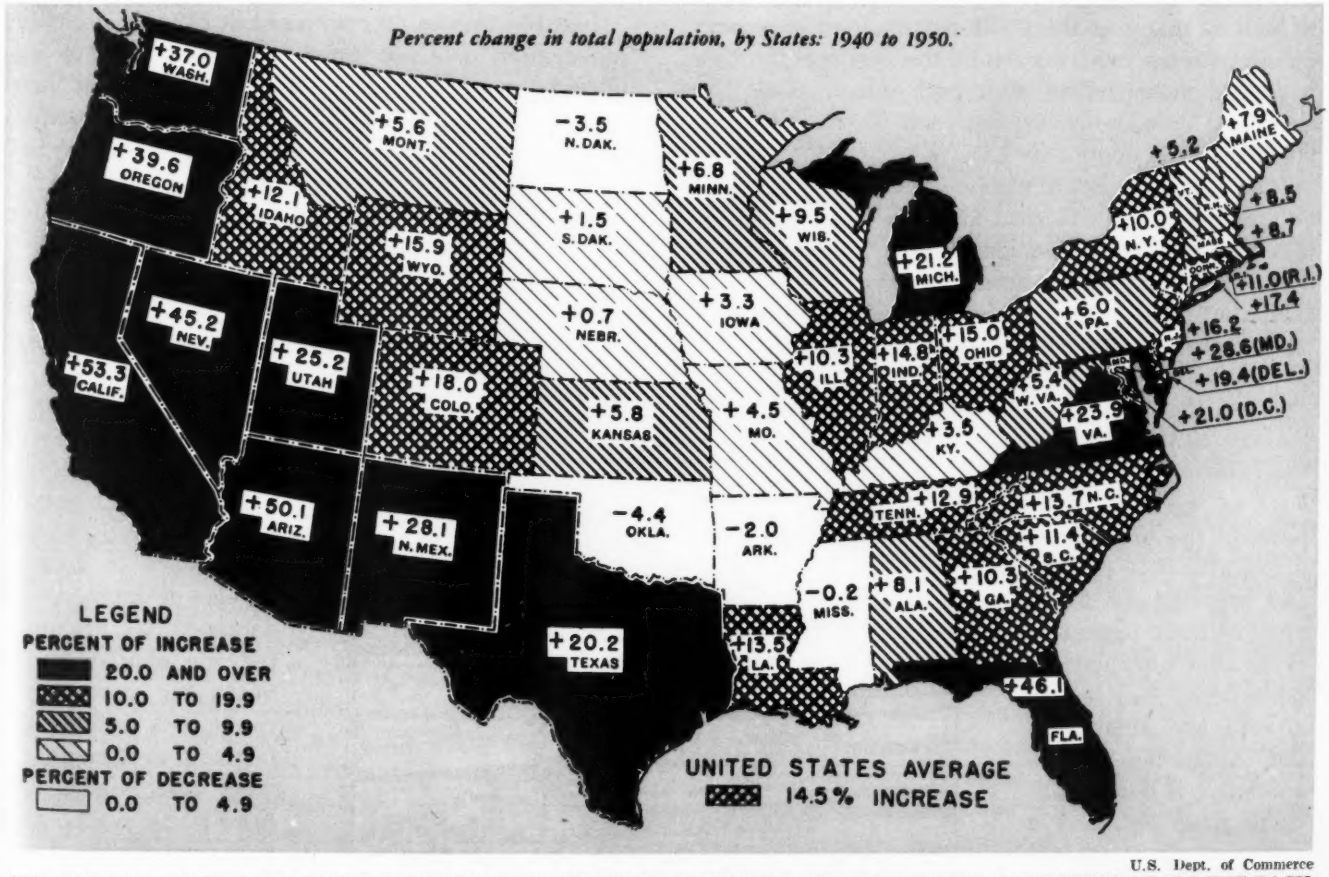
Structural Engineers

Shortly after the enactment of the California Registration Act of 1929, the need for better qualified specialists in the structural field was sensed by the civil engineers themselves. As a result, an Act was proposed to, and passed, by the Legislature requiring that civil engineers signing documents and drawings with the title of "Structural Engineer" be required to pass an examination to test their competency in this special field of practice. Further, the Field Bill was enacted by the Legislature requiring that in the design of school buildings the responsible designer must be either a certified architect or hold the title of "Structural Engineer."

Costly Earthquakes

Prior to the enactment of the Civil Engineering Registration Act, millions of dollars had been spent in the construction of school buildings, churches, auditoriums, and other public buildings without any minimum standards of design and construction being met and without adequate inspection. While many of these structures were properly designed and constructed, a very great percentage of them were either destroyed completely by the 1906 and subsequent earthquakes, or (as in the instance of many school buildings) were torn down and completely reconstructed under the direct supervision and control of the State Division of Architecture. The direct loss has already cost the taxpayers of California upward of a billion dollars.

With these failures in mind, there is little wonder that the administration of the Registration and related Acts is sufficiently exacting to insure that there will not be a recurrence of this tremendous



U.S. Dept. of Commerce

ALL OF THE FAR WEST AND THE SOUTHWEST HAVE SHOWN MORE THAN AVERAGE GROWTH. CALIFORNIA LEADS THE PACK.

loss to the public, caused by a lack of proper understanding by the registrant of earthquake design problems.

It is the thinking of the Board that it would be an unpardonable breach of a prescribed responsibility should it relax in any manner its concern in and for the safeguard of the life, health, property, and welfare of the public.

With the enactment of the 1947 Amendment to the Registration Act, extending registration to the branches of Mechanical, Electrical, Chemical, and Petroleum Engineers, it soon became evident that the engineers eligible in these several fields considered it a privilege, a duty, and a responsibility to legally qualify to practice in their chosen field. Very few persons have even offered to practice in these fields without having first qualified through registration.

The Examinations

The examinations required for engineering registration in California have been designed so that the first division of the examination tests the applicant's knowledge of fundamental engineering subjects including mathematics and the basic sciences; the second division of the examination tests the applicant's ability to apply his knowledge and experience and to assume responsible charge in the professional practice of his branch of engineering. Applicants for certification as Engineers-In-Training are required to take only the first division of the examination.

A large percentage of the out-of-state applicants as well as many of the California-trained engineers do not pass the examination on the first try; thus we have had many refiles after each examination. As a general rule, however, between thirty and forty percent of the applicants pass.

It has been the Board's policy to employ eminently qualified engineers to read and grade the examination papers on an impersonal basis. The examinees are identified only by number. After grading, the tabulated results, together with the examiners' comments, are presented to the Board for their final consideration and official determinations.

After the results of the examination have been checked and tabulated by the office staff, some of the unsuccessful applicants ask for and are afforded a review of their papers in order that questions of uncertainty may be answered and cleared to the satisfaction of the applicant. Where applicants have obtained a near-passing grade, their papers are reviewed by the Board to be sure that discrepancies in or mistakes of grading have not occurred.

The Board members are always pleased to have the comments and criticisms of the registered engineers relative to the scope of the examinations and the type of questions asked. During the last several years many suggested questions have been prepared either by interested persons or organized engineering groups. Many suggested questions have been made a part of the Board's examination.

As of January 1954, there were more than 26,000 Registered Engineers in California. The following table indicates the specific fields in which the engineers are registered:

Civil Engineers (mandatory)	7,000
Mechanical Engineers (permissible) .	10,350
Electrical Engineers (permissible) ..	4,901
Chemical Engineers (permissible) ..	2,220
Petroleum Engineers (permissible) ..	985
Land Surveyors (mandatory)	932
Total of all Registrants	26,388

There were 4308 Engineers-In-Training having no registration status but holding a certificate for having passed the first stage of the registration examination as of the same date, January 1954. In addition to the registrations shown in the listing, 550 registered Civil Engineers have further qualified as "Structural Engineers."

Just 10 years ago there were but 212 applicants for registration as Civil Engineers and some 100 applicants were admitted to practice during that year. In 1953, there were 3178 applicants for registration in the several branches of engineering, and of this number 1646 persons were admitted to practice.

The number of applicants for registration during the calendar year of 1954 increased to 5056. During one week-end the Board and its staff were confined to the task of examining 3000 applications for examination. Of this number, 1000 applicants were for the Engineer-in-Training test.

Despite California's unprecedent growth, the matter of qualifying competent engineers to practice is well in hand. The Board is keeping abreast of the increased demands. We are meeting the challenge and qualifying those applicants, both native Californians and engineers from other states, who measure up to the requirements of the Law. ▲▲

WHEN A CONSULTANT TAKES DESIGNS AND DRAWINGS FROM A MANUFACTURER OF EQUIPMENT AND PASSES THEM ON TO THE CLIENT, HE IS THEN NO LONGER ACTING AS A TRUE CONSULTING ENGINEER BUT ONLY AS A BROKER.

An experienced engineer with a large and reputable manufacturer registers a complaint against one type of consultant. He calls attention to an unethical practice all too common today. What he wants to know is . . .

Are You a Consultant Or a Broker?

Ce exclusive

M. BRENNER, P.E.

HOW MUCH responsibility is shifted by the consulting engineer from himself to the equipment suppliers? Frequently, the client believes that the consultant is engineering the job when in reality he is farming most of it out to the major suppliers involved on the project.

When a client brings a problem to a consulting engineer, he expects to buy impartial, objective, engineering advice. He expects a correctly engineered job from the technical point of view and an economically designed job representing the best he can afford to buy for his money.

The manufacturer's interest is to see that his products are specified wherever possible. A wise manufacturer is further interested in seeing that his products are used properly, since it only takes one or two misapplications of a good product to lead to a bad name in the industry. For this reason, many manufacturers maintain "application engineers," "technical service engineers," or "sales engineers" whose sole job is to see that the product line is used properly and correctly specified. The more complex the line, the more the talents of men like these are required by the manufacturers.

We can assume, then, that the consulting engineer is interested in providing a sound, economical, job for his client; the manufacturer is interested in selling his products and seeing that they are used properly. Problems arise when the consulting engineer finds it easier to turn to the suppliers for design help rather than to analyze and solve his own problems. He may be under-manned, he may not be quite expert in the particular subject at hand, he may be in a rush to meet a deadline, he may have underbid the job without realizing what was involved, he may be weak financially, or he may be under competitive pressure. Whatever the reason, he finds the free assistance offered by the manufacturers difficult to turn down and looks to one or more of them for help. As a "service engineer" I know that this happens all too often these days.

Depending upon the size of the job, the help may run from as little as suggesting materials, to a design complete with detail drawings and layouts. The amount of help will also vary from job to job depending upon the personal relationship previously established and the competitive situation in the industry supplying the equipment.

When these situations arise, the manufacturer is put on the spot. He is damned if he does and damned

if he doesn't. If he helps out and invests engineering time and effort in working with the consultant, he expects to be awarded some of the business involved. If he does not help out, one or more of his competitors will frequently be only to glad to step in.

The consulting engineer receives so-called "free engineering help," but he must realize that he, or really his client, must pay for it. If the manufacturer must maintain an engineering staff to help solve his customers' problems, the cost of these engineers is bound to be reflected in the selling price of his equipment. These increased costs are sometimes reflected in the particular job at hand, but more often they show up across the board in a generally higher priced line. When all companies in an industry offer these services to their customers, everyone is on an equal footing. But frequently one or two companies in a particular field have large engineering departments to handle their situations while a good many competitors in the same field do not offer equal service. This frequently leads to unpleasant situations where the designs of manufacturer "A" are called for, since he helped the consultant engineer the job, but the installing contractor will use manufacturer "B" by applying the "or equal" clause in the specifications.

What Is the Answer?

With the large, well-staffed, consulting engineer this is not a common problem. He has sufficient specialized manpower available to evaluate all manufacturers' claims and designs, to prepare his own designs, and to go into the market for genuine, competitive bidding on equipment if he wants to. Such a firm can be a true consultant, "One who gives professional advice or services in the field of his special knowledge or training." It is living up to the demands of both technical and ethical standards. On the other hand, a smaller consultant is frequently under greater pressure, and he may not always be able to abide by the rules. He frequently does not have available on his staff the technical know-how required. He then plays the role of a broker, "One who for a commission or fee brings parties together and assists in negotiating between them." He is primarily an agent of the party originally employing him. He is bringing the needs of his client to the attention of manufacturers capable of filling them.

There is nothing inherently wrong with this so long as everyone is completely aware of what is going on. The consultant still plays an important role if he evaluates for his client the products of different manufacturers. The difficulty arises when no evaluation is made. When a job is done by merely taking a manufacturer's design or drawings, copying them, and passing them off as originals, then the engineer is not even acting as a broker. It is not a healthy situation for any of the parties — the client, the consultant, or the manufacturer. The engineer is, to say the least, not being ethical, for the client is under the distinct impression he is buying completely objective advice.

When this situation arises the client might just as well deal directly with the manufacturer —which many do. The client, of course, may be doing himself a disservice, since he usually does not have the background to properly evaluate the manufacturer's claims. (Only a properly licensed consulting engineer should offer professional advice.) This might also be considered unfair competition, since it tends to freeze out the consultant.

If the consultant, client, and manufacturer will appreciate their roles—and if the client, and consultant, as well as the installing contractor—will each stick to their proper work, a much healthier relationship will exist all around. The consultant who gets his work done for him by a manufacturer is not only costing his client money but is driving business out of his own profession. ▲▲

Record-Breaking Construction To Continue

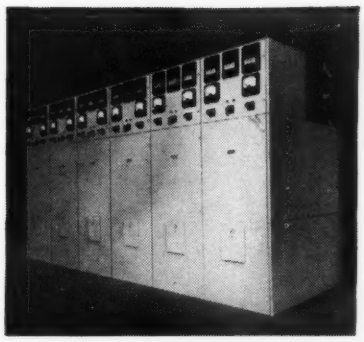
FOR THE NINTH consecutive year, construction records were broken and promise to be broken again, according to the Associated General Contractors of America. In 1954, an estimated $52 billion of work was done. It accounted for 15 percent of the gross national product and 17 percent of the nation's gainfully employed.

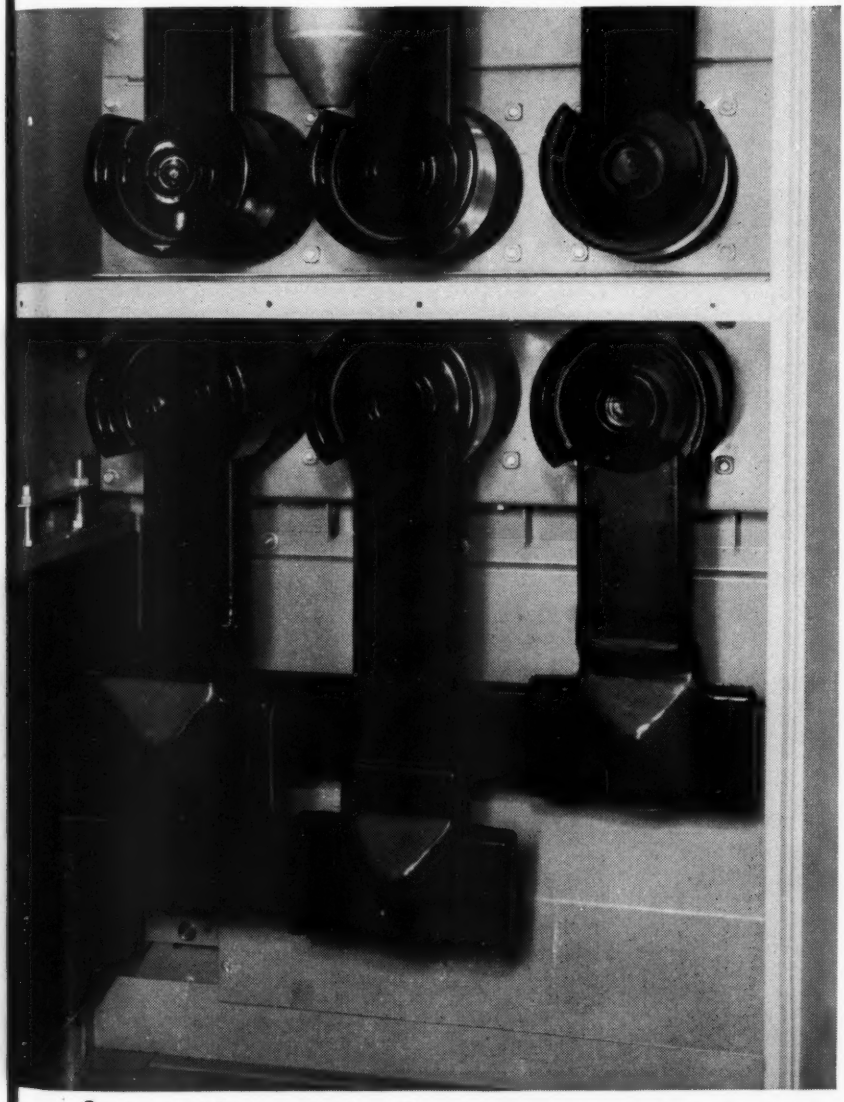
Construction totaling $56 billion is predicted for 1955. This is based on indications of a moderate upswing in total economic activity, availability of capital at favorable rates, relatively stable construction costs, no major work stoppages, and no international complications.

The stimulus for 1955 construction comes largely from increasing pressures of civilian needs. Private construction of all types is expected to boom to $27.75 billion. Public construction is expected to top $12 billion, with state and local public works accounting for two-thirds of this total.

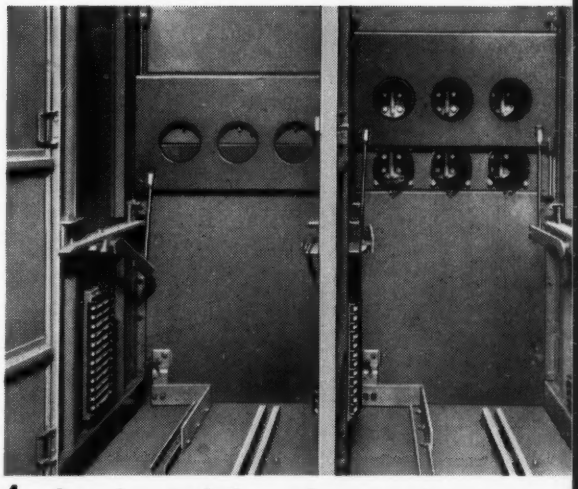
Increasing volumes of construction are expected in the years to come, based on three factors: the tremendous need to expand community facilities to catch up with present needs, the annual population growth of 2.7 million creating even more demand, and the unfolding of new horizons in industry—such as electronics, plastics, and atomic energy. ▲▲

See the extra value Clad Switchgear





3. Bus rigidly braced, heavily insulated. View into rear of 13.8 kv compartment shows porcelain disconnect bushings and bus supports which insulate and hold the bus in alignment during short circuit stresses. Steel paneling throughout forms isolated compartments.



4. Superior isolation of compartments. Gravity-type shutters, shown closed at left and blocked open at right, isolate primary terminals from breaker compartment.

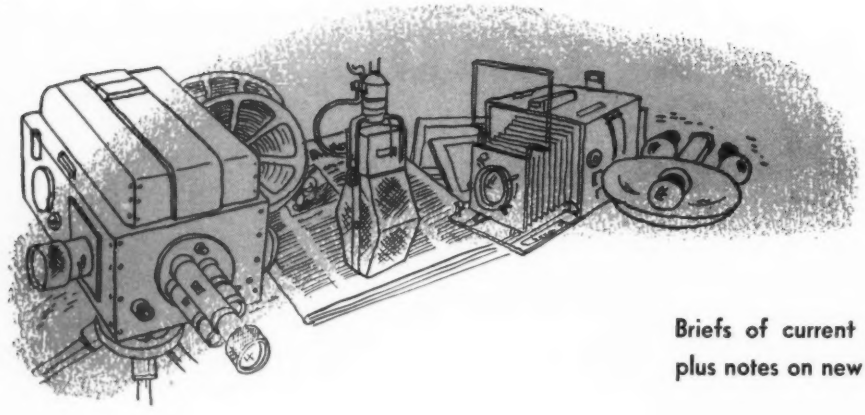
5. Fine, durable finish. All panels and doors are first bonderized and cleaned with spirits, then painted with three coats of enamel—baked on and rubbed down.

make. I-T-E Metal-Clad Switchgear is available in ratings through 13.8 kv, 500 mva.

For details, contact the I-T-E field office nearest you. Look in your classified directory under "Electric Equipment." I-T-E Circuit Breaker Company, Switchgear Division, 19th and Hamilton Sts., Philadelphia 30, Pa.

I-T-E

CIRCUIT BREAKER COMPANY
Switchgear Division



NEWS

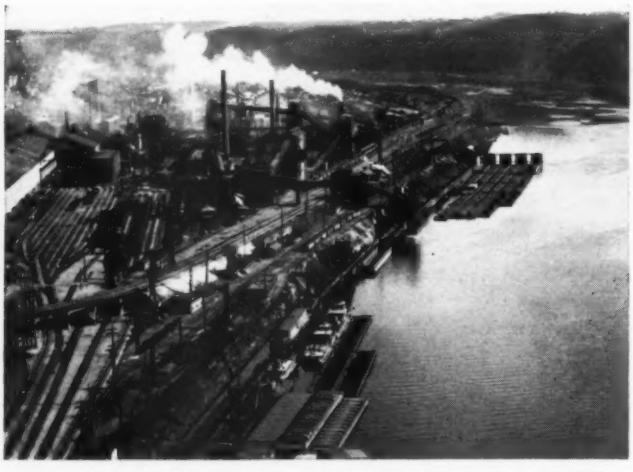
Briefs of current interest to the consulting profession plus notes on new equipment in the field of engineering

Dock Design Promises To Reduce Maintenance Costs

Growing interest in inland waterways transportation and the decision of more companies to locate plants near navigable rivers has made it necessary to develop docks that are not only initially low in cost but are economical to maintain.

At Jones & Laughlin Steel Corporation's Hazelwood, Pa. By-Products Plant, high and recurring cost of maintenance for a 35-year-old wooden river dock led the company to call in the Contracting Div. of Dravo Corp. for design and construction of a new facility of steel sheet pile cells.

Seven hundred and fifty feet of the old wharf was replaced with nine steel sheet pile cells. Two of the cells, each 16 ft 1-½ in. in diameter, were constructed



BARGES ARE MOORED TO STEEL CELLS 60-75 FT APART.

by Dravo adjacent to an existing coal-handling elevator. The other seven, 13 ft 7 in. in diameter, were driven along the dock line spaced on 60 to 75 ft centers so that barges may be moored to them.

Each cell was driven to rock, filled with river sand and gravel, and then capped with 18 in. of reinforced concrete. Cells were connected by a walkway constructed of steel grating.

To minimize future maintenance, steel fenders were also installed on two existing stone piers at the dock. One pier supports the coal barge unloading equipment and the other is used for loading liquid by-product tar. The fenders consist of steel Z piles, interlocked and attached horizontally to the wharf line for the length of the piers. Fenders extend from pool elevation to the top of the new dock.

Provisions for handling barges were incorporated in the design of the steel pile cells. Mooring rings and bitts and ladders are built into the cell structures and three stairways are installed to give additional access to moored barges. Winches to move the barges along the dock line have been relocated on the new cells, along with sheaves for barge-moving cables.

One of the principal advantages of the steel sheet pile method of river dock construction is the anticipated maintenance-free service of the facility. Steel cells can withstand constant contact of barges and towboats where a timber dock, extending the entire length of the harbor, is subject to damage at any point along its length.

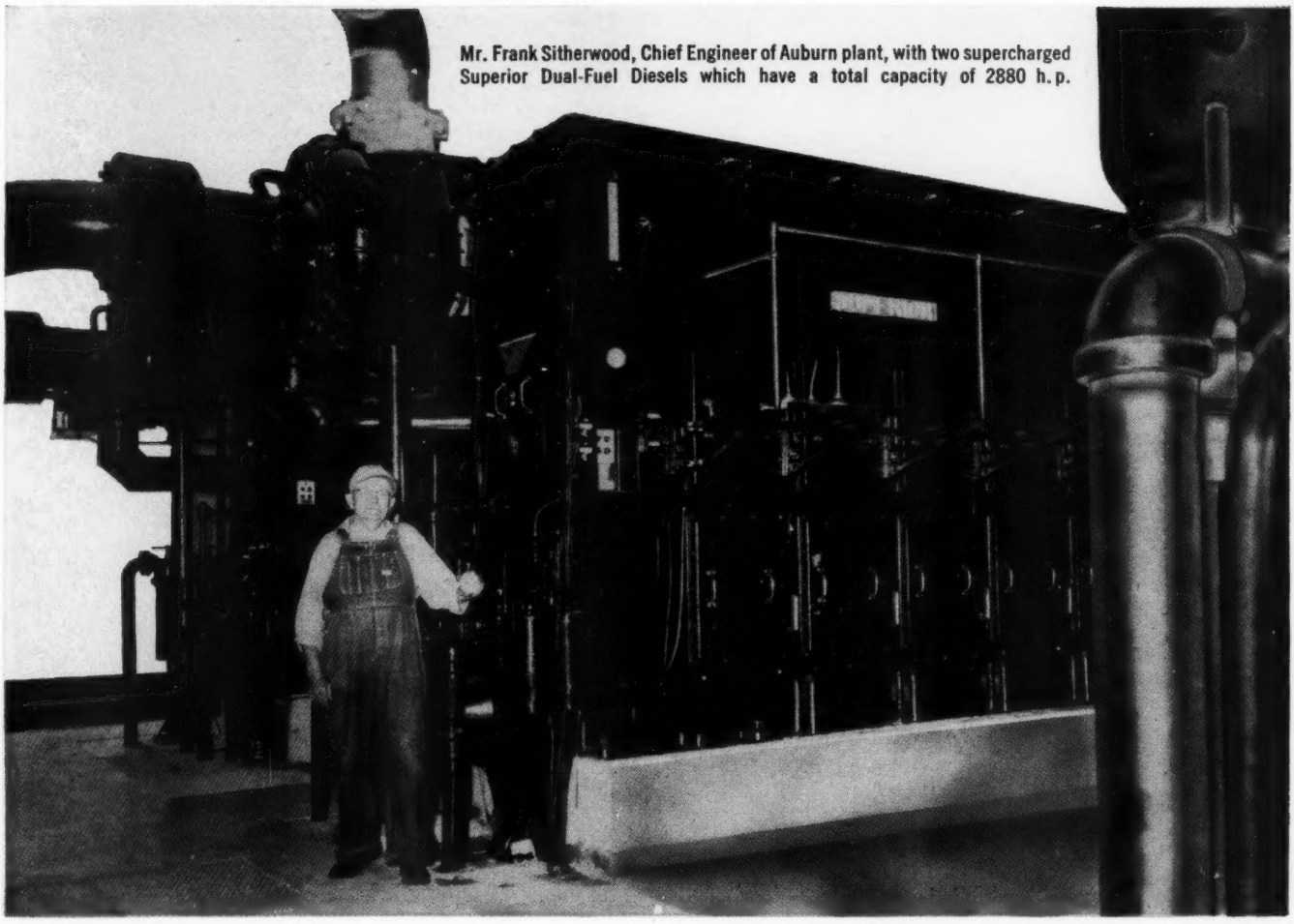
State Reorganization Commission Urges Revamping of Building Laws

The confusion that can result when no over-all plan is followed in regard to building regulatory laws is evident in the report of the N. Carolina Commission on Reorganization of State Government.

The study group found no less than six state agencies have authority to promulgate some types of building regulations. Four state agencies now pass upon plans for private construction, seven pass upon plans for one or more types of public buildings, and five agencies make periodic inspections to determine if unsafe or unhealthful conditions exist.

Building laws were found to be complicated and difficult to locate: they are scattered through 11 chapters of the general statutes; through rules and regulations of the numerous agencies concerned with building; and through ordinances, resolutions, rules, and regulations of county commissioners, county boards of health, city councils, and sanitary district boards.

As a step toward clarifying the situation, the group suggested that the State Building Code Council be expanded to include representatives of the state enforcement agencies and the municipalities. The council now is composed of an architect, a structural



Mr. Frank Sitherwood, Chief Engineer of Auburn plant, with two supercharged Superior Dual-Fuel Diesels which have a total capacity of 2880 h.p.

Auburn, Nebraska, pays off power plant debt

5 years ahead of schedule!

Last year, the Board of Public Works of Auburn, Nebraska, paid the last $76,000 of a bonded municipal debt which totaled $279,000, six years ago. This final payment was five years ahead of schedule, for which the Board gave credit to a pair of Superior Dual-Fuel Diesels.

The first Superior, originally a straight diesel rated at 960 h.p., was installed in the power plant in 1946. Dual-fuel equipment was added in 1948, to enable the engine to operate on diesel or natural gas, depending on supply and price.

The following year, the Board produced 190,000 *more* kilowatt hours of electricity for 21,800 *less* dollars. Fuel savings accounted for all but $250 of the total cost reduction!

When Auburn's generating capacity had to be increased in 1949, the Board bought a new Superior supercharged dual-fuel diesel—for obvious reasons—and in 1952, added a supercharger to the first one.

This is just one example of the many outstanding economy records made by Superior and Atlas Diesels. You can easily get more information on the engines to profitably meet your power needs by calling the nearest sales and service office listed below.

DIESEL DUAL FUEL GAS — THE NATIONAL SUPPLY COMPANY — ATLAS Imperial DIESEL ENGINES — Superior ENGINES — DISTRIBUTOR OF Lister DIESELS IN U.S.A.

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Commission Urges Changes

—*Starts on page 60*

engineer, a general contractor, a plumbing and heating contractor, and a representative of labor.

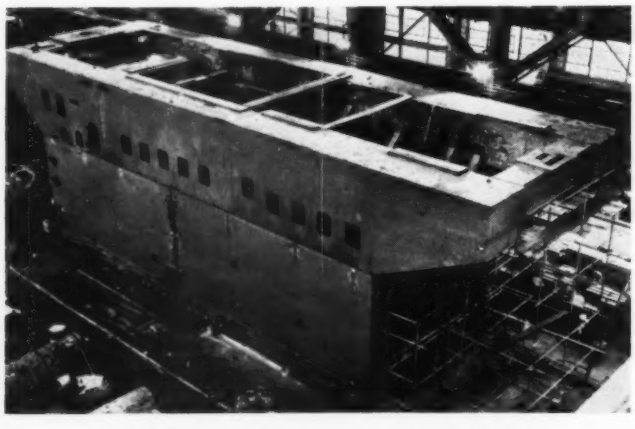
It was also proposed that the state insurance commissioner, the secretary of the State Board of Health, commissioner of labor, superintendent of public instruction, and assistant director of the budget be designated ex officio members, that the governor name a municipal building inspector as an additional member, and that a licensed electrical contractor be included in the membership.

Under the commission's proposals, the Building Code Council would be given the duties of adopting a state building code including all building regulations promulgated by any state agency, hearing appeals from decisions of the enforcement agencies, recommending statutory changes to the State Legislature, and determining which enforcement duties could be shifted to local officials. The council would also be directed to make recommendations to the General Assembly as to how building laws might be consolidated at one place in the statutes.

The commission further called for establishment of a permanent inter-departmental regulation committee to establish procedures for the exchange of building plans among interested agencies and to arbitrate disputes between the agencies. The engineering division of the State Department of Insurance would be enlarged and become the staff for the Building Code Council and inter-departmental group.

The federal government has moved to clarify the confusion existing on a nation-wide level as to materials available and necessary for civilian and defense construction. At an industry conference of representatives from the building materials and construction industries in November under sponsorship of the Building Materials and Construction Div., Business and Defense Services Administration, the BDSA outlined a five-point program designed to provide better statistical information. The program, in order of priority, is:

(1) Improve new construction activity estimates;
(2) Collect data on improvement expenditures;
(3) Conduct semi-annual surveys of residential vacancies;
(4) Make material use surveys;
(5) Revise completely the building materials production index.

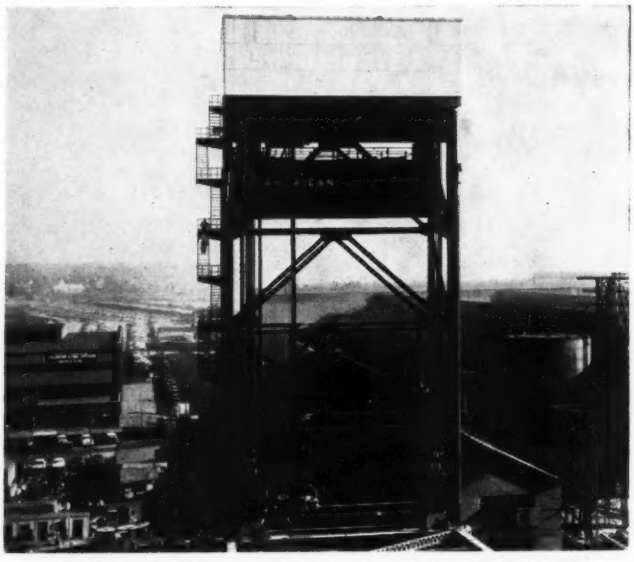


CONDENSER DOUBLES AS FOUNDATION.

Shown under construction at Westinghouse Electric Corp., this 60 ft long condenser, now installed in the Raritan River Plant of Jersey Central Power & Light Co., serves as foundation for the 125-MW turbine above it, saving several feet of headroom, some foundation construction, and concrete.

Bridge Builders Use Porcelain Enamel to Combat Errosion

Builders of the lift bridge at South Park Ave. in Buffalo, N. Y. faced a tough problem in accelerated corrosion promoted by highly corrosive chemical fumes originating from plants immediately adjacent to the structure. The problem was so severe that special steel alloys coated with acid-resisting paints had to be used for main bridge members.

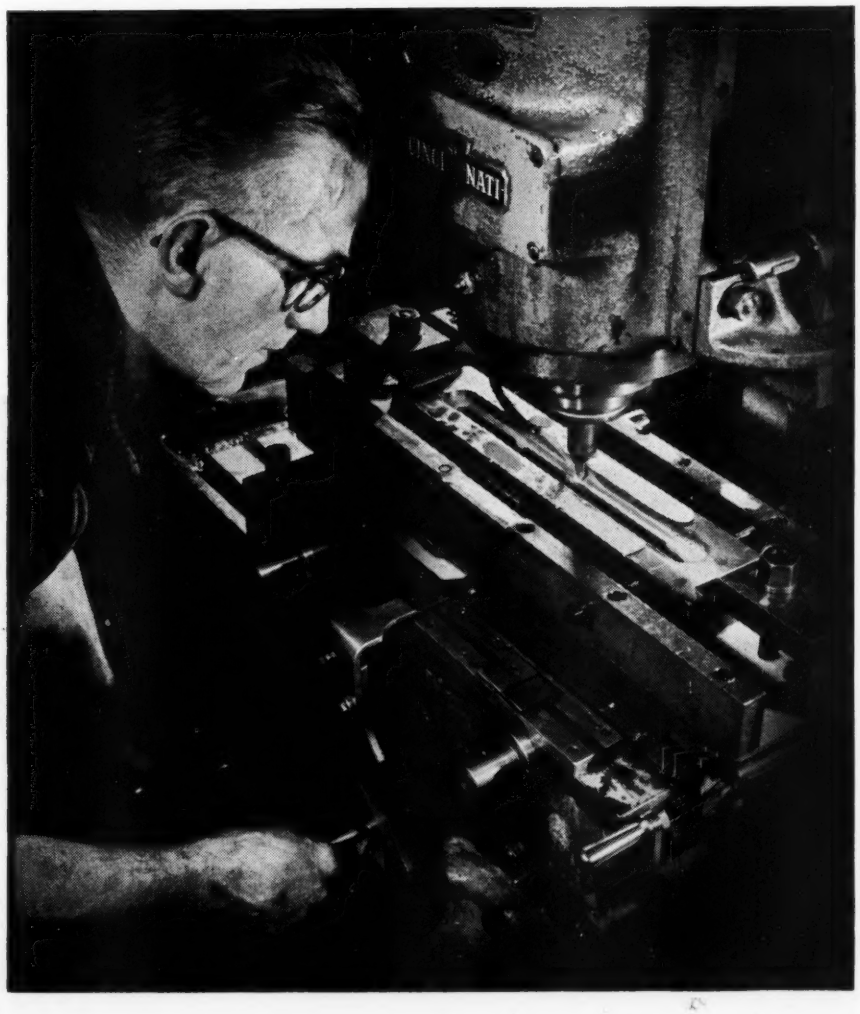


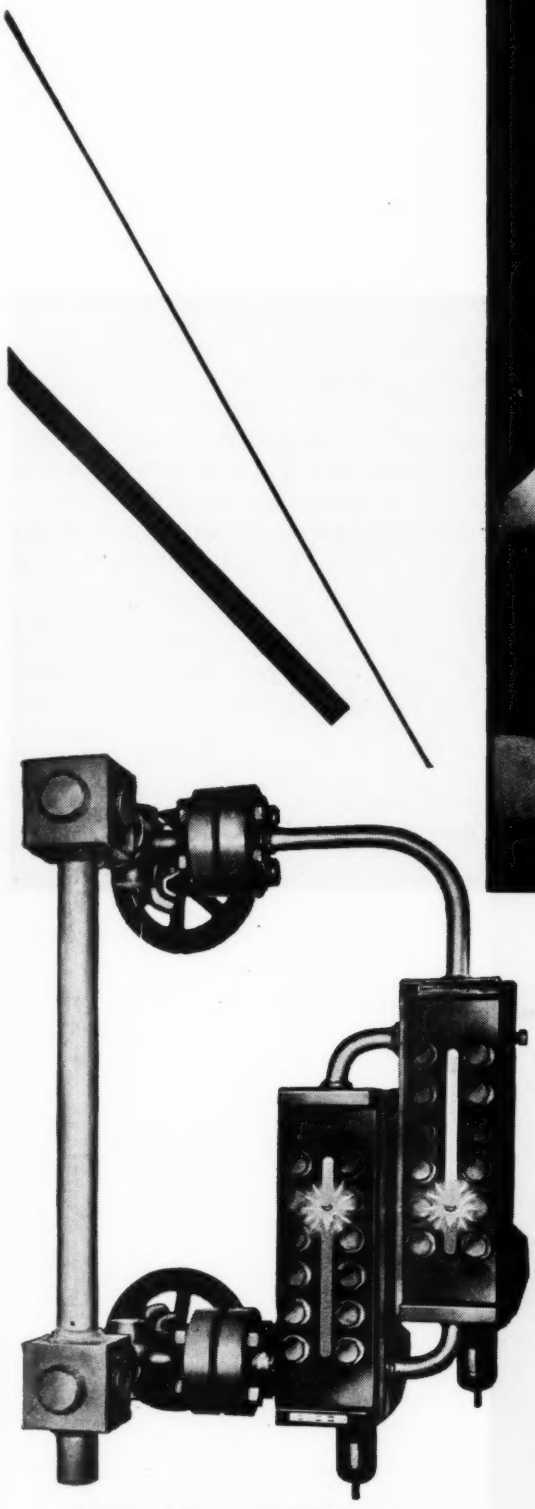
MACHINERY HOUSE SIDING IS PORCELAIN ENAMEL.

In designing the machinery houses, specially compounded porcelain enamel coatings were used wherever possible, including the siding panels. During the enameling run at Erie Enameling Co., where the coatings were developed, random sheets were pulled from production and submitted to Pittsburgh Testing Laboratories for final check to be sure that the sheets could meet the requirements. In addition, Erie Enameling developed special vinyl gasketing to take the place of caulking in joints between porcelain enameled panels. Stainless steel was used extensively for attachments and trim.

Engineers Seek Equation For Cooling Tower Performance

The complex factors affecting cooling tower performance make it difficult for the designer-manufacturer to predict just how close a particular installation will come to the specifications. Engineers





Yarway High Pressure Boiler Water Gage with separated-design flat glass inserts. Write for Yarway Bulletin WG-1812.

HE'S A SPECIALIST ON STAINLESS STEEL INLAYS

● A dentist? No.

He's a Yarway craftsman. In the picture above he is milling a gasket groove in the stainless steel facing that is used for this important part of a high pressure boiler water gage body.

The man is important; so is the inlay.

The man is typical of the skilled workmanship that goes into every Yarway gage, blow-off valve, steam trap or other product —workmanship that makes no compromise with quality.

The stainless steel facing is typical of advanced Yarway engineering design. That inlay is but one of twelve basic improvements made in Yarway high pressure water gages.

When buying boiler water gages as well as other steam plant equipment, measure the cost in terms of good engineering, quality, workmanship, and dependable service.

"Make Yarway your way."

YARNALL-WARING COMPANY
106 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

YARWAY

steam plant equipment

BLOW-OFF VALVES
WATER COLUMNS AND GAGES
REMOTE LIQUID LEVEL INDICATORS
EXPANSION JOINTS
DIGESTER VALVES
STEAM TRAPS
STRAINERS
SPRAY NOZZLES

WHEN YOU PLAN...
TO SAVE COSTS
Factory-trained Cyclotherm engineers will . . . without charge . . . work from drafting board to installation to estimate your steam demands.
TO SAVE TIME
Factory-trained Cyclotherm servicemen are as close as your telephone . . . They are on call at any hour of the day, night or week-ends.
TO SAVE SPACE
Cyclotherm Steam Generators range from 18 to 500 hp. . . . from 15 to 200 psi. For industrial and commercial plants, shipping, institutions.
Select a CYCLOTHERM STEAM GENERATOR

Planning a new building? Remodeling an existing structure? As much as ⅓ smaller than other packaged units, the Cyclotherm Steam Generator allows more space for storage and production. Needs only a minimum-sized, minimum-cost boiler room. Or can be placed in a working area. Radiant heat loss is at a minimum.

Lighter-weight, it costs less to transport. Simpler in design, it requires less rigging time . . . rigging costs.

Yet it delivers a guaranteed 80% efficiency . . . pays for itself in a few years in fuel savings alone . . . cuts maintenance costs up to 50%. And it gives you 66% more steam generating power per sq. ft.! Needs less heating area per boiler h.p.!

Exclusive, patented Cyclonic Combustion combined with simplicity of boiler design produces maximum heat transfer wringing every degree of heat from each fuel molecule . . . wasting none. Does in 2 passes what other combustion methods accomplish in 4. Cyclotherm's even rate of heat transfer eliminates localized, heat-retarding scale and "hot spots." All these features assure you of maximum performance.

FREE **Discover how Cyclotherm can give you more steam for your dollar. RETURN THIS COUPON TODAY.**

YEARS AHEAD IN STEAM GENERATION
CYCLOTHERM®
Steam & Hot Water Generators

Cyclotherm Division
U. S. Radiator Corp.
Oswego, New York

Cyclotherm Division, U. S. Radiator Corp.
Dept. 442 Oswego, N. Y.
Gentlemen: I am interested in reducing steam costs and space.
☐ Please send a Cyclotherm engineer to help estimate my steam requirements.
☐ Please send me your illustrated folder on Cyclotherm Steam Generators.
NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE__ STATE____

Engineers Seek Equation

—Starts on page 62

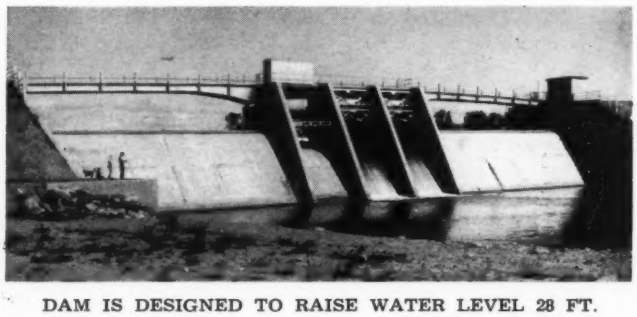
at a cooling tower laboratory near Independence, Mo., operated by J. F. Pritchard & Co., hope to evolve an equation that will make it possible to predict performance of decking without actual testing.

The immediate objective is to measure cooling tower performance, using various arrangements and construction materials, and to determine performance characteristics of different types of deck filling: how well the various types of decking cool water; air pressure drop through decking; how much wood is required; how simple decking is to fabricate; and how easy it is to install and remove.

The 50 ft high and 6 ft square tower used for the experiments has a capacity range of ½ gal per min per sq ft up to well in excess of ten gal per min per sq ft. Experimental equipment can supply heat loads over 10 million Btu per hr. The air system is on automatic electronic control for both wet bulb and dry bulb air temperatures. Controlled air inlets enable engineers to test 80 F wet bulb in winter. Air stream humidity, water temperature and flow, and air flow can also be controlled and measured.

Dam on Knee-Deep River Supplies Water for 175,000

In 1924 Flint, Michigan, with a view toward increasing its supply of water, started a topographic survey of the Flint River Valley but had to abandon the survey when mounting costs indicated the complete survey would itself take most of the money available. Instead, the city built a dam on Kearsley Creek which empties into the river near the city.



DAM IS DESIGNED TO RAISE WATER LEVEL 28 FT.

But with the rapid expansion of the area during the war and post-war years, more water was needed.

Plans for a river dam 10 miles above the city were outlined. Since the 1924 plans were given up because of survey costs, accurate aerial survey methods had been perfected and this newer method was chosen.

The Corps of Engineers joined in the project and ordered an air survey of the adjacent area upstream to study the effects of higher water on the property owners and communities above. Both surveys were made in 1947 by Abrams Aerial Survey Corp.

Holloway dam, completed in 1953, will store 5760 million gallons of water and, with the old Kearsley

reservoir, there will be available a supply of 6410 million gallons of water, enough to supply the city for nearly a year at maximum consumption should the stream go dry completely.

The dams also assure the city a constant river flow to prevent stagnation; carrying away the discharge from the sewage disposal plant below the city. The Kearsley dam crest was lowered once during the past season to flush out the slow-moving, near-stagnant water during the summer dry spell. The city's water pumping station is upstream where the water supply is taken from the river, pumped into a clear water reservior, treated, and supplied to city mains.

The water conservation bond issue is scheduled to be retired in 20 years at which time population growth surveys indicate a line must be run to Lake Huron, 65 mi away.

Limestone Mine Is Converted Into Underground Freezer

Storing materials underground in caves or worked-out mines has inherent economies; temperature is low and constant and construction costs are considerably less since walls and roofs are already in place. The federal government made use of a limestone quarry near Atchison, Kansas, during World War II to store surplus foods. The same cave is now stocked with surplus machine tools stored by the Army.

Near Kansas City, Mo., refrigerated storage rooms are now being built in the worked-out section of an operating limestone mine. Almost nine acres will be turned into a huge underground freezer to be used as an in-transit warehouse for edible products being shipped from the west coast to various parts of this country and abroad. Most of the storage rooms will be maintained at -10 F with about ten percent of the space kept at 38 F.

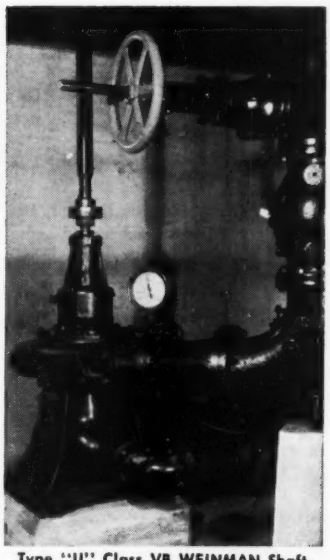
A spur of the Santa Fe Railroad will extend 1000 ft into the cave which is owned by inland Cold Storage Co. Eight refrigerated rooms will lie on either side of the siding with storage space for 2500 carloads of frozen foods. A loading dock for motor trucks will adjoin the track entrance.

Walls between the rooms are being lined with five inches of Foamglas cellular glass insulation, a product of Pittsburgh Corning Corp. On perimeter walls

FREEZER ROOMS CONSTRUCTED ON EACH SIDE OF RAILROAD SPUR ARE INSULATED WITH FOAMGLAS.

SERVICE PROVEN

by years of use under the most gruelling conditions!



Type "U" Class VB WEINMAN Shaft-Driven Vertical Centrifugal Pump

WEINMAN

type "U" vertical

NON-CLOGGING PUMPS

The Type "U" Class VM Vertical Centrifugal Pump is identical in construction details with the Class VB . . . except that impeller is carried on motor shaft. Either requires less floor space for mounting than horizontal designs, allowing comparable savings in foundation costs.

Efficient and dependable under the heaviest loads, Weinman Type "U" Non-Clogging Centrifugal Pumps easily handle liquids of varying viscosity, plus those containing extremely large amounts of foreign material suspended in sludge form. The non-clogging operation of Weinman Type "U" Pumps is especially valuable when large solids or masses of flocculated sediment are being carried.

Where pumps of complete reliability and proven performance in handling turbid liquids are required, there you will find Weinman Type "U" Centrifugal Pumps . . . the Class VB, ideal for dry-pit installation, driven by flexible extension shaft; the close-coupled Class VM, with low-level suction connection and high-mounted motor, or the column-suspended Class VS, for submerged service. In addition, the Class B and Class M are available when horizontal types are preferred . . . with motor, belt or close-coupled motor drives.

Write, wire or phone

Representatives in principal cities

Built by Centrifugal Specialists

The WEINMAN Pump Mfg. Co.

Plant-location news

How to get facts on raw materials

Just what do you need to know about raw materials before you pick a new plant site? Where to get aluminum castings in a hurry? How much it will cost to deliver 200 tons of Connellsville coal daily to your doorstep? Are synthetic yarn suppliers near at hand? Where can you find large and available quantities of high calcium limestone? Can you expect a continuing local supply of veneer logs? Storage and terminal facilities for handling bulk items? A chemical analysis? A cost schedule?

Whatever you need to know about a material—whether it's of local origin or comes from New Zealand, whether it's still in the earth or in a semi-processed state—New York State's Industrial Location Service will give you the answers fast. And there's no cost or obligation.

I don't think there's any industry we can't serve. No matter what your special problems, we'll tell you where to locate needed materials and supplies. Because most of our clients are sticklers for perfection, we are, too. We'll describe the quality and quantity of raw materials, and give the total cost for delivery to any destination you say.

The full story in two weeks

Recently a manufacturer of glass bodies for electronic tubes wrote us for information on the materials vital to his operation—glass sand and natural gas. Our ILS staff set to work as they always do. They studied geological maps, analyzed samples, tabulated supply data, sent out information requests to district Industrial Location Service offices, and consulted experts in the field. Within two weeks the manufacturer had a complete, concise report on his desk covering several desirable industrial locations.

Quick and easy to read

He didn't have to wade through complicated charts, graphs, and heavy-going paragraphs. The report was current, complete, and took note of his problems.

He didn't have to follow up footnoted references, or check so-and-so's special report on the sands of Upper Hollow. With the data furnished in our report, he could pick the best possible plant location with unerring accuracy.

Other free plant-site services

Raw materials won't be your only concern when you're looking for a new plant location. But no matter what factors are involved, ILS can be of help. Free reports are available on transportation, markets, water, labor, buildings and sites, and local laws and regulations—to mention just a few.

Our booklet called "Industrial Location Services" shows how you can put this valuable plant-location data to work. To get your copy, just write me at the New York State Department of Commerce, Room 868, 112 State Street, Albany 7, N. Y.

Ronald B. Peterson

Director, Industrial Location Service

Mine Is Converted into Freezer

—Starts on page 65

a total of six inches, double coursed, will be used. Piping which carries cold brine at -24 F to the five cooling units in each room will also be Foamglas insulated. Engineers estimate that even with a complete refrigeration breakdown, temperature rise would be only 2 or 3 F in two weeks.

The underground freezer will enable a frozen food broker or packer to ship a carload of frozen food to Inland without a final destination. The shipment will than be held in storage until a market opens up.

Built-In Drainage Will Help to Eliminate Icy Pavement

In an effort to minimize the possibility of accidents on the Ohio Turnpike, the designers have planned for a 56-ft strip separating the east and west traffic lanes, each of which consists of a 24 ft concrete strip

Warner & Swasey Co.

ONE OF FOUR GRADALLS USED ON JOB PUTS FINISHING TOUCHES ON CENTER DRAINAGE DITCH.

with 10-ft hard surface shoulders bordering each outside lane and 8-ft hard surface shoulders bordering each inside lane.

Between the edges of the two inside shoulders is a 40-ft planted mall depressed 4 to 5 ft. In the center of this mall is a drainage ditch so that snow can be pushed into the depressed center strip to avoid the danger of water from melting snow turning back on the Turnpike and freezing as is the case in some of the earlier turnpikes.

AICE Panel Will Discuss Foreign Aid Program and Engineerng

Program for the February 2nd, monthly meeting of the American Institute of Consulting Engineers will feature a panel discussion on "Engineering and the Foreign Aid Program." Panel members will be Maurice R. Scharff, Franklin J. Leerburger, William Ginsberg, C. Stribling Snodgrass, and Burnside R. Value, all of whom participated in the recent inspection of 74 industrial projects in Europe, Africa, and the Near East financed in part by American aid. The luncheon is at 12:30 P.M. in the Engineers' Club, New York City. ▲▲

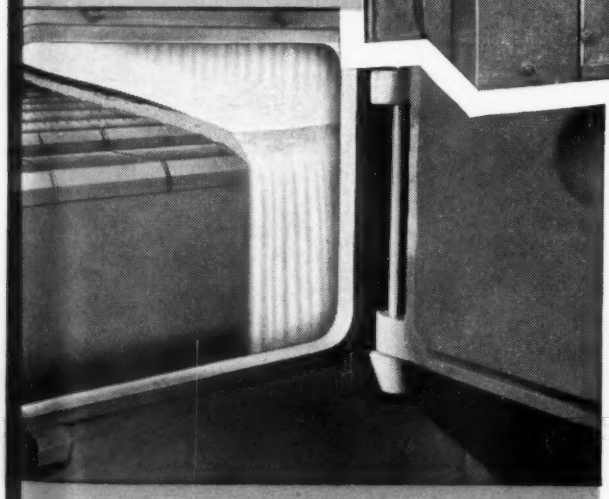
Another great Detroit Stoker.....

MOST IMPORTANT DEVELOPMENT IN COAL BURNING SINCE INTRODUCTION OF THE DETROIT ROTOGRATE

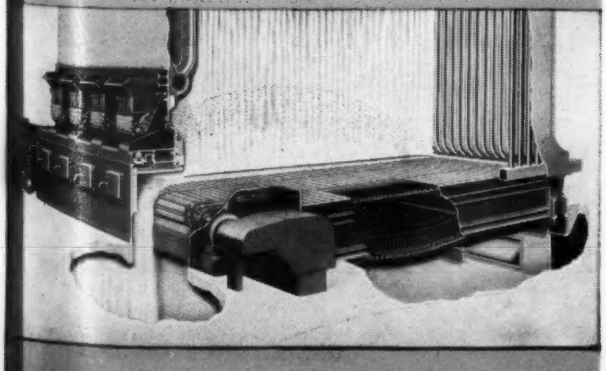
Detroit RotoStoker Type C-C
(CONTINUOUS CLEANING)

Detroit RotoStoker Type C-C discharges ash continuously at the front.

Detroit RotoStoker Type C-C (Continuous Cleaning)



Detroit RotoGrate Stoker—Traveling Grate Spreader Stoker



DETROIT ROTOSTOKER TYPE C-C

Users of medium and small size steam generators may now have the long proven advantages of continuous ash discharge spreader stoker firing with the Detroit RotoStoker Type C-C.

CHECK THESE ADVANTAGES:

- **Cleans Fuel Bed and Discharges Ash Continuously at the front.**
- **Smokeless Operation Through a Wide Load Range**
- **Efficiently Burns Bituminous Coals and Lignite.**
- **Insures Continuous Uninterrupted Steaming Capacity and High Availability.**
- **Responds quickly to Fluctuating Loads**
- **Fuel Feeders Handle High Moisture Coals Easily and Without Clogging**
- **Operation Automatic and Dependable**
- **Easily Applied to Existing Boilers—No Basement Necessary**
- **Design results in Low Maintenance**
- **Many Sizes Available to Develop from Approximately 5,000 to 75,000 Pounds of Steam Per Hour**

For large steam generators Detroit RotoGrate Stokers have proven their merit for more than fifteen years. The *first* and *foremost* traveling grate spreader stoker, the Detroit RotoGrate Stoker was first to establish the tremendous advantages of continuous ash discharge, spreader stoker firing.

DETROIT STOKER COMPANY

GENERAL MOTORS BLDG., DETROIT 2, MICH.

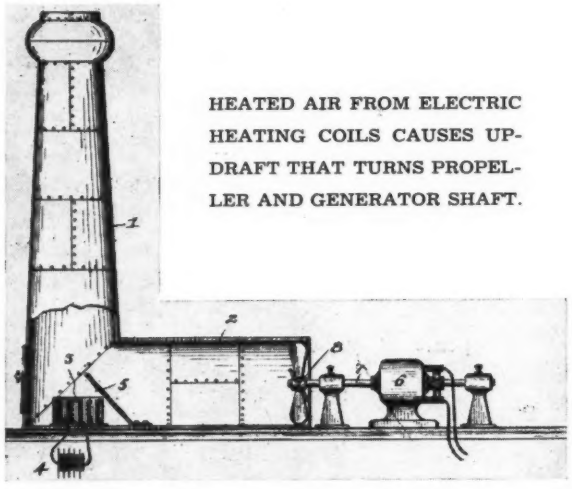
Works at Monroe, Mich. • District Offices in Principal Cities

Genius at Work — 1902

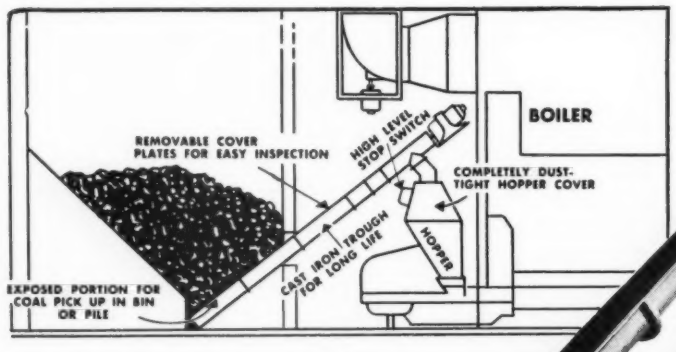
BACK IN 1902, the generation of electricity was fraught with the problem of soot coming out of the station stack, much the same as today. But Enoch Claud Woodell, Highpoint, North Carolina patented an invention that would do away with the air pollution problem — and even would come close to perpetual motion at that.

The way he figured was this: Battery 4 would heat resistance coils 3. The heated air would rise past deflector 5, creating an updraft up through stack 1. This would draw air through flue 2 past propeller 8, thus turning the propeller. Shaft 7 would therefore revolve, and turn dynamo 6. In turn, the dynamo would supply electric power.

Even Mr. Woodell did not claim that the generator could charge the battery to keep the system going indefinitely. But we wonder why it never occurred to him that it might be simpler to take electric energy directly from the battery. He did suggest that other sources of hot air could be used to maintain an updraft through the flue and chimney. We wonder what he had in mind. At any rate, the Patent Office went along to the extent of granting Patent No. 695524, dated March 18, 1902. ▲▲



HEATED AIR FROM ELECTRIC HEATING COILS CAUSES UPDRAFT THAT TURNS PROPELLER AND GENERATOR SHAFT.


BOILER
REMOVABLE COVER PLATES FOR EASY INSPECTION
HIGH LEVEL STOP SWITCH
COMPLETELY DUST-TIGHT HOPPER COVER
CAST IRON TROUGH FOR LONG LIFE
HOPPER
EXPOSED PORTION FOR COAL PICK UP IN BIN OR PILE

WRITE FOR ----THIS---- BROCHURE

CANTON STOKERS

CANTON'S EXCLUSIVE NEW BINFED-RAMFEED STOKER

Conveys coal direct from coal storage to furnace without labor. Can be installed from front, side or rear of boiler. The complete Conveyor-Stoker is available as a package unit only from Canton Stoker Corp.

This type of installation pays for itself usually within one year through savings in labor and increased efficiency. Completely automatic and dust-free, it allows use of Canton's rugged Vulcan or LoSet Ramfeed Stokers, with the steady, dependable Flo-Tube Spiral Conveyor keeping the hopper filled. Flow of coal is pro-rated according to steam demand. Write for complete information on this time and money-saving combination.

CANTON STOKER CORPORATION

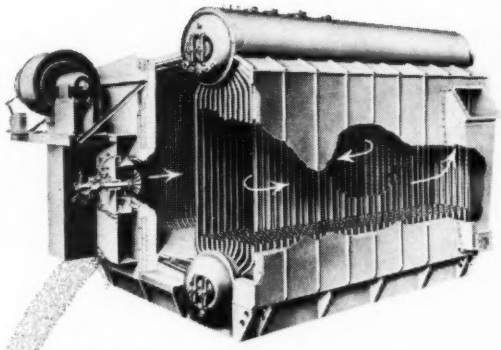
SPECIALISTS IN AUTOMATIC COAL FIRING, HANDLING AND CONTROL EQUIPMENT

425 Andrew Place S. W.
CANTON, OHIO

STANDARD BOILERS THAT SET INDUSTRY STANDARDS

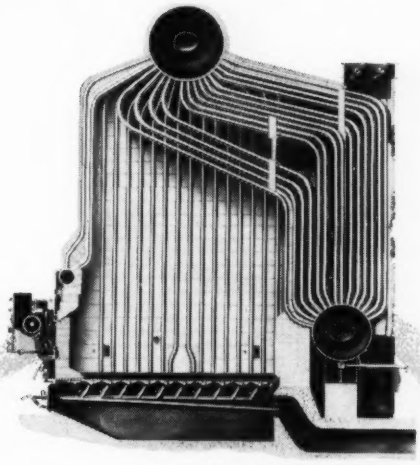
Whatever your steam needs, in the complete C-E line of fuel burning and steam generating equipment, you will find a type and size just right for you.

In the moderate capacity range, for example—from 4,000 to 120,000 pounds of steam per hour—the three *standardized* C-E Boilers shown here offer advantages of economy and performance that make them standout values in a wide range of applications.



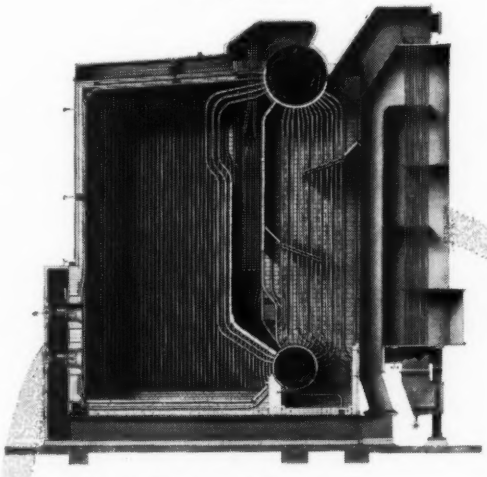
C-E Package Boiler, Type VP

4,000 to 40,000 lb steam per hr . . . pressures to 500 psi . . . for pressure firing of oil or gas . . . completely shop-assembled, needs only simple concrete slab for foundation. Has more water-cooled area per unit of furnace volume than any other boiler of its size and type. Large lower drum permits simple, symmetrical tube arrangement . . . great water storage capacity . . . easy access. Low-speed centrifugal fan is unusually quiet in operation. Simple baffle arrangement means low draft loss . . . simple soot blowing . . . no dead pockets . . . high heat absorption.



C-E Vertical-Unit Boiler, Type VU-10

10,000 to 60,000 lb steam per hr . . . pressures to 475 psi . . . superheat to 200 F in larger sizes . . . for coal, oil or gas . . . bottom-supported, needs no outside supporting steel. Boiler is efficient over a wide range of output, and is easy to operate and maintain. All parts are readily accessible for inspection. Regardless of fuel, the same general cross-sectional arrangement of drums, convection bank and furnace cooling is used. Uniform design through each transverse section assures even water level in drum, and uniform expansion.



C-E Vertical-Unit Boiler, Type VU-55

50,000 to 120,000 lb steam per hr . . . pressures of 250 or 500 psi . . . superheat and heat recovery equipment if desired . . . for oil or gas . . . bottom-supported, needs no outside supporting steel. This boiler is of symmetrical design. Thus gas temperature is constant across the full boiler width. The narrow, high furnace . . . integral design of boiler and preheater . . . absence of exterior ductwork . . . compactness—all help the VU-55 achieve standards of performance closely approaching that of large central station boilers.

Other C-E Industrial Boilers

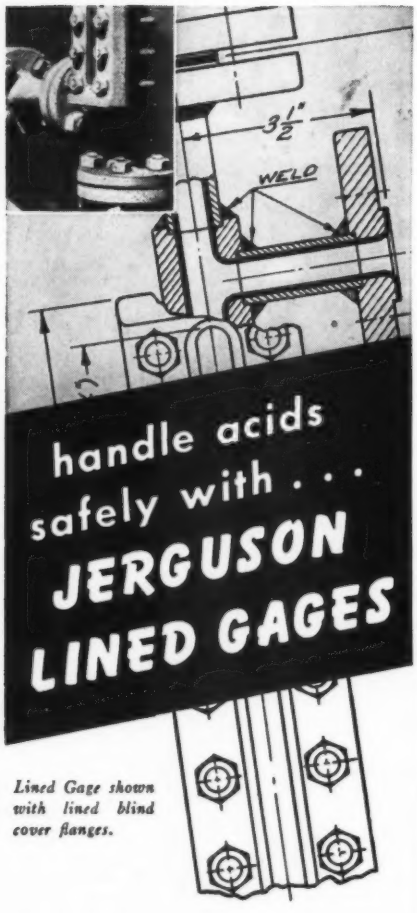
In addition to the standard boilers shown here, Combustion offers many other 2-drum designs, for capacities to 350,000 pounds of steam per hour, for any commercially available fuel, for pressures to 1375 psi, and temperatures to 960 F. Heat recovery equipment is available. So — whatever your steam needs — call Combustion for details on the complete line of C-E Industrial Boilers.

B-767A

COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

Boilers, Fuel Burning & Related Equipment; Pulverizers, Air Separators & Flash Drying Systems; Pressure Vessels; Automatic Water Heaters; Soil Pipe



Lined Gage shown with lined blind cover flanges.

WHERE concentration of liquids such as sulphuric, muriatic or other acids necessitates equipment with special linings, Jerguson can furnish you with reflex or transparent gages lined with natural and synthetic rubbers, lead, phenolic base compounds, Teflon, and other materials. Jerguson Lined Gages are designed to meet your requirements of long-life and dependable operation.

To meet your constantly increasing variety of demands, Jerguson engineers, working closely with the men in the Chemical and Petrochemical Fields, have developed a complete line of sound, dependable liquid level gages, valves, and specialties in various metals and synthetics to handle corrosive liquids and gases.

Jerguson Gages keep you out of trouble, and they save you time and money. Send for drawing GD-431 on Lined Gages, or send your requirements.

JERGUSON

Gages and Valves for the Observation of Liquids and Levels

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Offices in Major Cities

Jerguson Trees Gage & Valve Co., Ltd., London, Eng.
Pétrole Service, Paris, France

MEN IN ENGINEERING

★ At Pioneer Service & Engineering Co., D. C. Hormell has been elected vice president and chief engineer of the company.

★ Lockwood Greene Engineers, Inc. have elected Samuel B. Lincoln chairman of the board, William J. Heiser president and treasurer, H. Morgan Rogers, Jr. vice president, and Samuel J. Roberts a director of the company.

★ Fluor Corp., Ltd. announces opening of a Denver district sales office under the management of L. O. Calkins.

★ The American Society of Civil Engineers announces establishment of the Ernest E. Howard Award in honor of the late past president of the Society. The Award, made possible by funds donated by his widow, will be made annually "to recognize a civil engineer who has made a definite contribution to the advancement of structural engineering through writing or performance."

★ Roberts and Schaefer Co. has merged into Thompson-Starrett Co., Inc. as a wholly owned subsidiary. Principal offices of Thompson-Starrett are now at 130 N. Wells St., Chicago 6, Ill.

★ Elected to serve three years on the board of directors of the Association of Consulting Management Engineers, Inc. are: John Drury Sheahan, of Drake, Startzman, Sheahan and Barclay; Robert W. Kent, of Bigelow, Kent, Willard & Co.; and G. Corson Ellis, of A. T. Kearney & Co.

★ The American Society of Heating and Ventilating Engineers, at a special meeting in New York, voted to change the name of the Society to The American Society of Heating and Air-Conditioning Engineers, Inc.

★ Dr. Gordon N. Scott, consulting engineer in Los Angeles and W. H. J. Vernon, of England have been selected to receive 1955 National Association of Corrosion Engineers awards at the NACE 11th Annual Conference and Exposition in Chicago on March 7-11. Dr. Scott receives the Frank Newman Speller Award for achievement in corrosion engineering, and Vernon the Willis Rodney Whitney Award for achievements in the field of corrosion science.

★ Chester J. Abend, former chief of design and development for the Braun-Crystal Mfg. Co., announces formation of his own industrial design office at 19-20 147th St., Whitestone, L. I., N. Y.

★ The Engineers Club of Kansas City announces the establishment of a Grant-in-Aid or Scholarship Fund

GREEKS ON TOUR

Greek Engineers in U.S. to study power plant construction, are shown after a tour of Benjamin F. Shaw Co. Seated are: Charles Schmalenberger, Ebasco Service, Inc.; Marino Kallikourdis; Benjamin F. Shaw II; and Emmanuel Yiparakis. Standing are: Thomas Dimitriadas; Panayiotis Gouraris; and John Avramadis.

to help finance college engineering courses for youths in the Kansas City area. Donations from engineering firms in the area and funds from the Engineers Club have made the Grants-in-Aid possible.

★ Otto F. Sieder is elected to the newly-created post of vice chairman of the board of The H. K. Ferguson Co. Wells N. Thompson, formerly vice president and manager of the New York office, succeeds Sieder as president. John R. Whitehead is appointed chief engineer of the Cincinnati office of Ferguson and will be in charge of all engineering work in the Greater Cincinnati Area. New address for the Cincinnati office is Cooper and Wyoming Avenues, Lockland, Ohio.

SIEDER DYKINS

★ At Kuljian Corp., Daniel H. Dykins is appointed manager of utilities, and William J. Fadden Jr., is appointed chief mechanical engineer.

★ New officers of the American Institute of Chemical Engineers are: president, Barnett F. Dodge, Yale University; vice president, Arthur K. Doolittle, Carbon and Carbide Chemicals Co.; re-elected treasurer, George Granger Brown, University of Michigan; executive secretary, F. J. Van Antwerpen, former editor of Chemical Engineering Progress and at present publisher of AIChE.

★ The 1954 Professional Progress Award in chemical engineering, sponsored by Celanese Corporation of America and administered by the American Institute of Chemical Engineers, has been awarded to John R. Bowman, director of research at Mellon Institute for Industrial Research, Pittsburgh, Pa.

★ The Lummus Company has been awarded the contract to engineer and construct a sixty ton per day anhydrous ammonia plant for Westvaco Chlor-Alkali Div. of Food Machinery and Chemical Corp. The plant will be located at South Charleston, W. V., with completion scheduled for late 1955.

★ Merritt-Chapman & Scott Corp. have established new executive offices at 261 Madison Ave., N. Y., for centralized administration of their recently expanded operations. The

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glass fiber pipe insulation!

Molded in one piece with single seam.

Anyone can carry feather-light 6′ sections.

Just spread seam snap over pipe join seam with staple.

Paint if you like. No mud or dust no clean-up time no breakage. Sizes ¾-33" for hot or cold* piping. Picture the savings.... Then write today for samples and details.

*Comes with factory-applied vapor barrier facing adhered

Call your local Snap*On distributor listed in the Yellow Pages of your Telephone Directory or write for new 8-page brochure!

gb GUSTIN-BACON

Manufacturing Company

Thermal and acoustical glass fiber insulations • Pipe Couplings and fittings

Molded glass fiber pipe insulation

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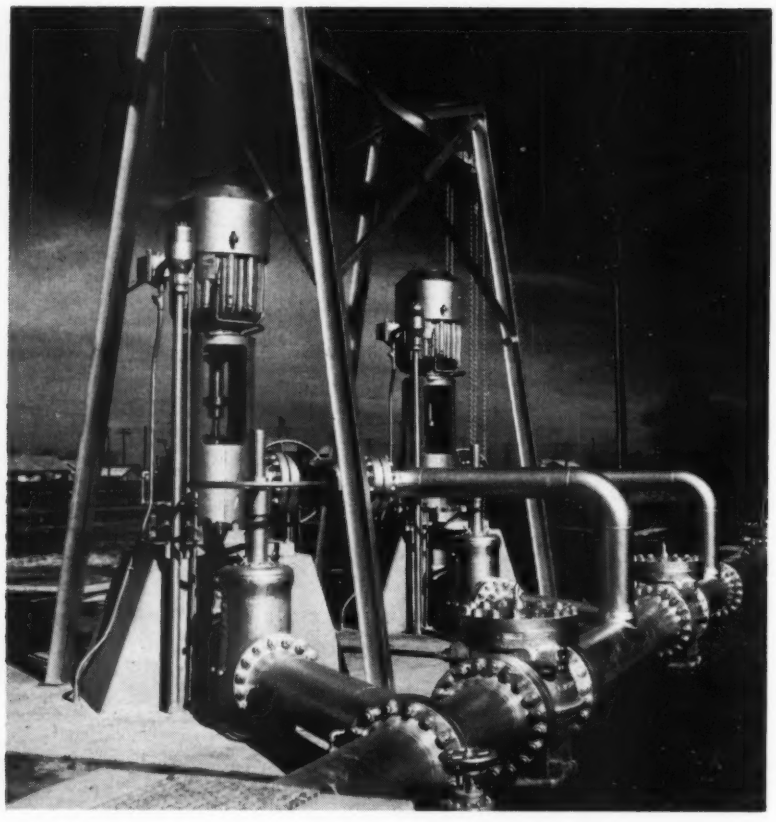
FOR THE *Best* IN BOOSTER LINE SERVICE

JOHNSTON VERTICAL PUMPS

use JOHNSTON vertical turbine pumps



Setting a high standard for excellence, Johnston Vertical Turbine Pumps are widely used for booster line service for pipelines, refineries, and chemical plants throughout the world. Unlimited flexibility of installation, with discharge heads to fit any system, makes these pumps highly popular with design engineers. For crude oil, gasoline, diesel fuel, ammonia, L-P gases and other volatile fluids, Johnston Pumps are dependable, easy to install, economical to operate.

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Bin "K" Pasadena 15, California

☐ Send Bulletins

☐ Have Representative Call

Name.....

Address.....

City.....Zone.....State.....

MEN

—*Starts on page 70*

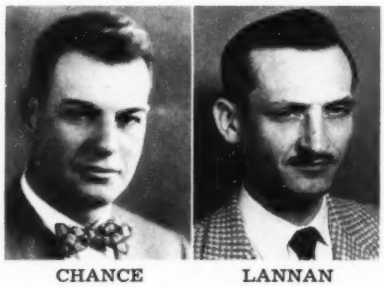
offices at 260 Madison Ave. will continue to serve as operational headquarters for the company's activities in the fields of construction, marine salvage, and derrick hoisting.

★ Frederic R. Harris, Inc. announces election of Julius E. Graf to the board of directors. Graf was formerly chief engineer of Jones & Laughlin Steel Corp.

★ Paul Rogers, principal in Paul Rogers & Associates, announces that his association with his partner, Howard J. Snitoff, has been dissolved effective January 1, 1955. Rogers will continue his consulting engineering practice under the same name. The office will specialize in structural design of sewage and water treatment plants, bridges, power stations, and multi-story buildings.

★ New officers of the Instrument Society of America are: Warren H. Brand, director of engineering and research at Conoflow Corp., president; A. A. Anderson and W. H. Fortney, vice presidents for two-year terms. Anderson is owner and president of Swissomatic Products, and Fortney is assistant superintendent of maintenance and construction at Humble Oil & Refining Co. Justus T. Volbrecht, president of Energy Control Companies, is elected to a second term as treasurer.

★ United Engineers & Constructors, Inc. announce election of Henry M. Chance, II as president. He has been vice president and a director of the company since 1949.

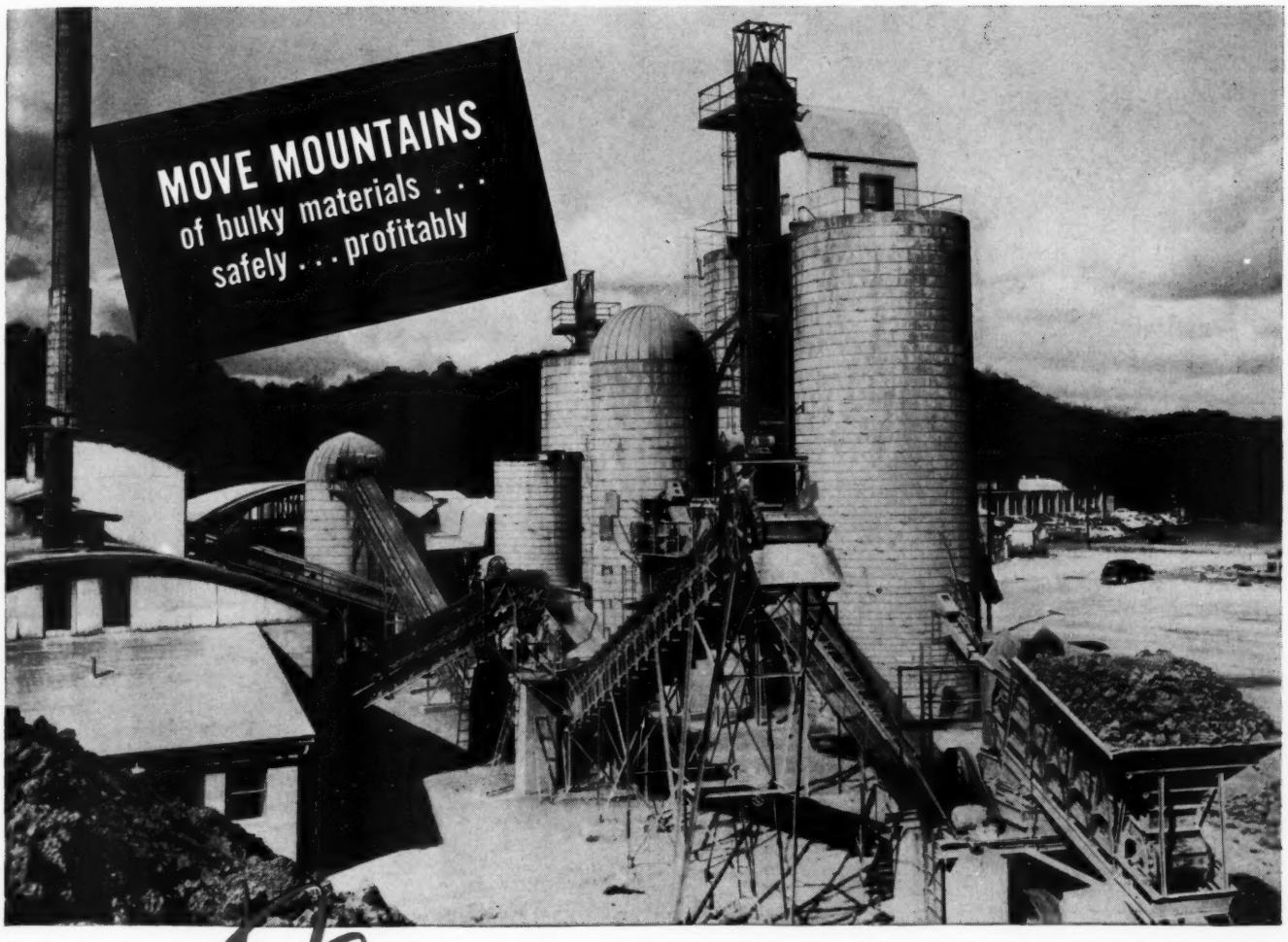


CHANCE LANNAN

★ Patrick E. Lannan joins the staff of Designers for Industry, Inc. as vice president and project manager of engineering in electronics and radio. He has also been elected to the board of directors.

★ Hall Laboratories, Inc. has appointed J. E. Summerville to the headquarters staff at Pittsburgh.

★ David Hendrickson, formerly senior engineer of the East Bay Municipal Utility District, Oakland, Calif., has joined The Hinchman Corp.

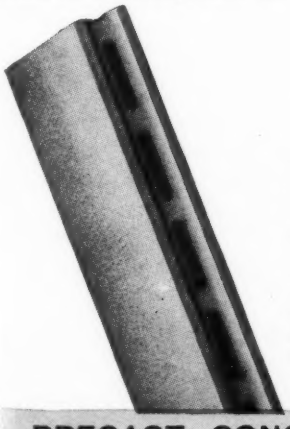


inside a Marietta concrete storage system

Meet increasing demands for safe, easily accessible storage for bulk materials now and be prepared for the future . . . with Marietta Concrete Storage Silos.

Your Marietta System will be engineered to perform every storage and materials-handling task your plant requires, with any type of intake or discharge or mechanical handling system that will expedite your operations. Any feature desirable can be provided . . . shakers, screens, live storage shelves . . . and the extra factor of strength built into Marietta Concrete Storage Silos makes it possible to mount heavy equipment on top or sides whenever needed.

This flexibility of design, incorporated in every Marietta Storage System, easily provides for increased handling capacity for future expansion, in addition to allowing you to enjoy lower operating costs today. Write Marietta for your catalog which shows how modern Marietta Storage Systems can cut your handling costs.



MARIETTA AIR-CELL lightweight aggregate STAVES

Stronger . . . thicker than standard staves . . . an exclusive Marietta development. Give greater protection especially when dry materials are stored.

Marietta precast Air-Cell staves, made from lightweight aggregate, are 3⅝" thick and provide insulation value equal to 15" of solid concrete.

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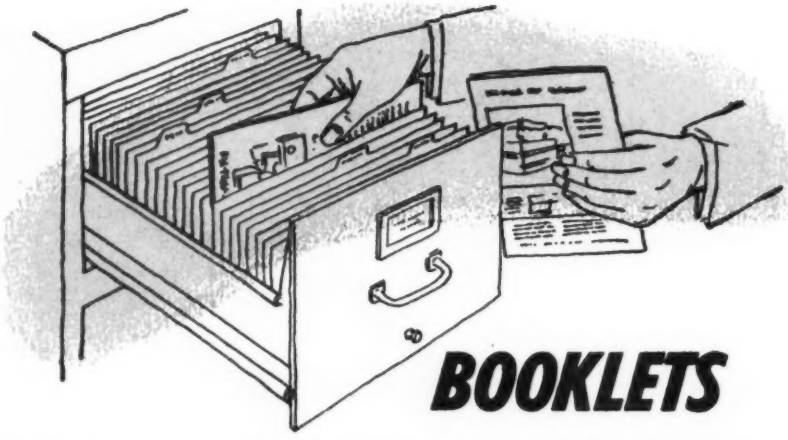
PRECAST CONCRETE PRODUCTS FOR FARM, HOME AND INDUSTRY



BOOKLETS

Personal copies of booklets can be obtained by writing directly to the manufacturers

"TEN CHOICE INDUSTRIAL SITES," 12-page booklet, is the result of a study of west central Ohio industrial sites where ground water is available in large quantities. Ten sections are shown by map with a description of advantages such as water supply, railroads, and power availability. *The Area Development Dept., Dayton Power and Light Company, Dept. CE, 25 N. Main St., Dayton 1, Ohio.*

TEFLON tetrafluoroethylene resin — its properties, uses, and processing techniques — are contained in 60-page manual A-8165. Illustrated with many pictures and diagrams, this booklet will prove to be handy reference material. *E. I. du Pont de Nemours & Co., Inc., Dept. CE, Wilmington 98, Del.*

"DUST AND FUME CONTROL," 11-page bulletin G406, tells of the many improvements and refinements that have been made in electrostatic precipitation since the first Cottrell precipitator was erected. Also included are background material and illustrations of the Multiclone mechanical dust collector, the CMP unit — a combination Multiclone and Cottrell unit, the Dualaire dust collector, and the Holo-Flite processor. *Westtern Precipitation Corp., 1000 West Ninth St., Dept. CE, Los Angeles 15.*

"THE ABC's OF SCHOOL LIGHTING," 20-page booklet B-4556-B, gives the basic requirements for school lighting systems and describes systems which satisfy these requirements. It discusses both new installations and relighting projects. *Westinghouse Electric Corp., Dept. CE, P. O. Box 2099, Pittsburgh 30, Pa.*

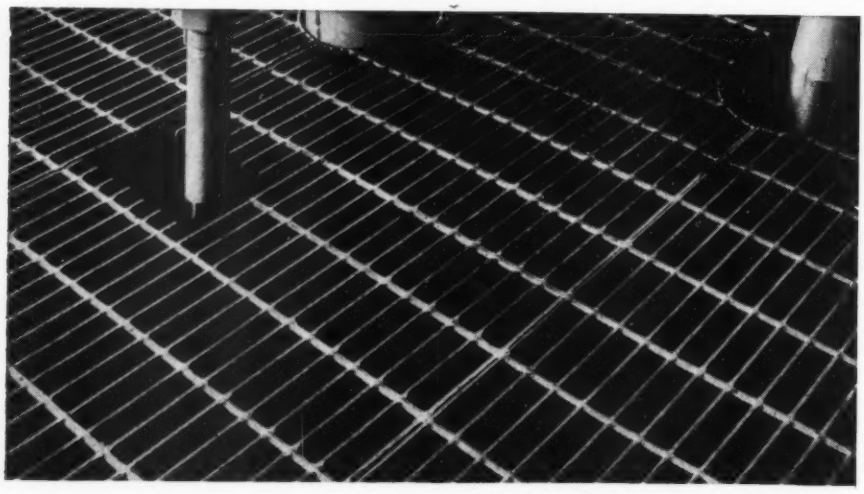
DOLLARS AND CENTS FACTS about economies possible in use of clad steel plates are contained in six-page folder, "Price Comparison — Clad Steels vs. Solid High Alloys." It discusses 16 standard alloy claddings on a variety of backing steels and shows how designer and fabricator can realize significant savings in equipment costs. *Manager, Marketing Service, Dept. CE, Lukens Steel Co., Coatesville, Pa.*

ROLLING DOORS—Blueprints showing architectural dimensions of basic door types, charts designed for quick selection of proper slats, guides, power units, and other components; photographs of standard and specially engineered installations; and full specification information are included in 11-page catalog 401-20. *The Cookson Co., Dept. CE, 1525 Cortland Ave., San Francisco 10.*

"A SUGGESTED SPECIFICATION FOR READY-MIXED ALUMINUM PAINT FOR HIGHWAY BRIDGES," presents one type of ready-mixed aluminum paint suitable for painting steel bridges and other outdoor steel structures. Prepared at the request of officials from state highway departments, this is a thorough, up-to-date discussion of pigment and vehicle. *Aluminum Company of America, Dept. CE, 747 Alcoa Bldg., Pittsburgh 19.*

"UNIFORM PUBLIC WORKS ENGINEERING CONSTRUCTION FORMS," is a complete set of documents including: (1) An Invitation for Bids; (2) Instructions to Bidders; (3) Bidder's Proposal; (4) Contract or Agreement; and (5) General Conditions of Contract. Forms have been officially approved by the American Public Works Association and The Associated General Contractors of America. *Associated General Contractors of America, Dept. CE, 2127 Munsey Bldg., Washington 4, D. C. Price is 25¢ each, $2.75 for 12, and $20.00 for 100. The document is designated APWA Standard Form A, and AGC Standard Form 10.*

LIGHTING AND DISTRIBUTION PANELBOARDS for industrial and commercial use are illustrated with construction design and application features explained along with ratings,



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WELDED GRATING

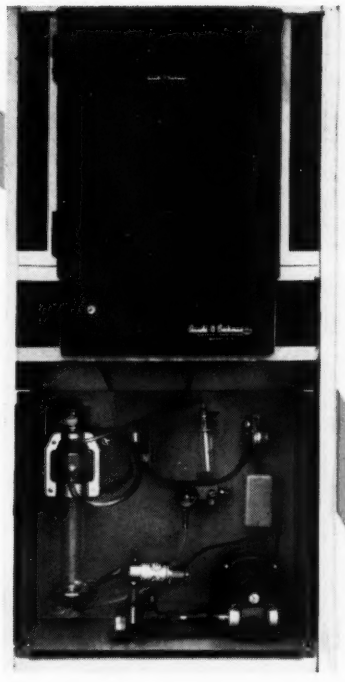
Tailor Made to Your Specs

Save installation time and money by having Gary factory-fabricate your open steel flooring needs. For complete description of Gary Gratings, write for Catalog No. CE-15.

FREE SAMPLE
We'll send this handy paper weight if you request it on your company stationery.

Standard Steel Spring Division
ROCKWELL SPRING AND AXLE CO.
4015 East Seventh Avenue • Gary, Indiana

NEW
Arnold O. Beckman
DISSOLVED OXYGEN ANALYZER
for continuous measurement!



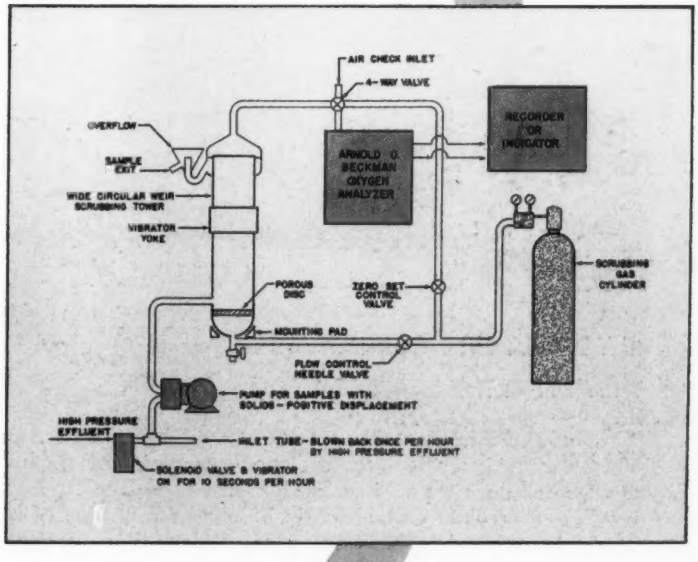
- Continuous record
- Handles fluids, slurries, sludges, etc.
- Simple operation
- Highly accurate

The Model 1A3B is a complete, compact unit—with the Analyzer in top compartment and the scrubbing unit below.

The accurate measurement of dissolved oxygen in fluid process streams is widely recognized as an important control factor in such municipal and industrial operations as sewage and water treatment . . . waste disposal . . . petro-chemical and chemical processes . . . food processes . . . and many others.

Now, you can make such measurements—continuously, simply and accurately—with the newly-developed Arnold O. Beckman Model 1A3B Dissolved Oxygen Analyzer!

- **The new Model 1A3B combines the field-proven Arnold O. Beckman paramagnetic principle of oxygen measurement with an improved method of stripping to provide a measurement specific for oxygen.**
- **The Model 1A3B is factory-calibrated to read in percent saturation so that efficiency of aeration or deaeration is shown directly. Or if preferred, the instrument can also be supplied to provide readings directly in parts-per-million.**
- **The Model 1A3B can be directly connected to any standard potentiometer-type recorder or indicator. No special accessory equipment is needed.**
- **Using the Model 1A3B is far superior—in speed, accuracy and convenience—to conventional chemical methods—and provides—immediately and continuously—the necessary control information for maintaining optimum processing uniformity.**


AIR CHECK INLET
4-WAY VALVE
OVERFLOW
SAMPLE EXIT
WIDE CIRCULAR WEIR SCRUBBING TOWER
VIBRATOR YOKE
ARNOLD O. BECKMAN OXYGEN ANALYZER
RECORDER OR INDICATOR
SCRUBBING GAS CYLINDER
POROUS DISC
ZERO SET CONTROL VALVE
MOUNTING PAD
FLOW CONTROL NEEDLE VALVE
PUMP FOR SAMPLES WITH SOLIDS - POSITIVE DISPLACEMENT
HIGH PRESSURE EFFLUENT
INLET TUBE - BLOWN BACK ONCE PER HOUR BY HIGH PRESSURE EFFLUENT
SOLENOID VALVE & VIBRATOR ON FOR 10 SECONDS PER HOUR

The Principle is simple and positive. The constantly-fresh test sample in scrubbing tower is stripped of dissolved oxygen by inert scrubbing gas—and result measured by Analyzer. Measurement is continuous and accurate!

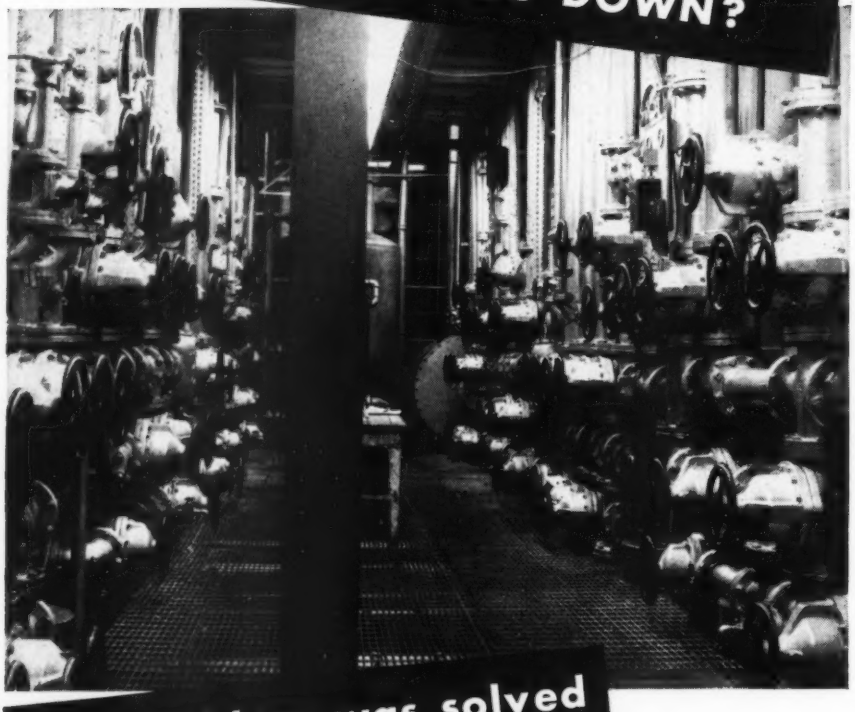
With a few variations the Model 1A3B can be adapted to a wide range of application requirements . . . to handling sludges and other liquids having high concentration of solids . . . to handling samples under abnormal pressures or temperatures . . . and to other difficult sampling conditions.

RANGES—from a maximum of 0-100% O_2 saturation to a minimum of 0-5 ppm, full scale. Intermediate ranges are also available.

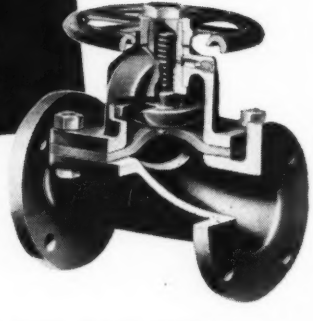
Arnold O. Beckman INC.

Get the full story *on this new Arnold O. Beckman development by writing directly for information on the Model 1A3B Dissolved Oxygen Analyzer. Ask for Data File # 13-S-15.*

VALVE MAINTENANCE COSTS GETTING YOU DOWN?



The problem was solved in this plant with HILLS-McCANNA diaphragm valves



IF YOU HANDLE CORROSIVE FLUIDS
THEY'LL DO THE SAME FOR YOU

The unique Saunders Patent design of Hills-McCanna Diaphragm Valves completely isolates the working parts of the valve from the flow. There is no packing to tighten or replace . . . no problem of leakage, internally or externally. You have a choice of body materials of any machinable alloy or linings of lead, glass, rubber, plastic, etc. Fifteen diaphragm materials are available including rubber, Neoprene and Teflon. There is also a wide choice of manual or remote operators. Sizes range from ⅜" through 14". May be used at pressures to 150 psi, temperatures to 350° F.

If you valve corrosive materials write today for descriptive folder. For specific recommendations send an outline of your requirements. HILLS-McCANNA CO., 2446 W. Nelson St., Chicago 18, Ill.

HILLS-McCANNA

saunders patent diaphragm valves

Also manufacturers of
Chemical Proportioning Pumps • Force-Feed Lubricators
Magnesium Alloy Sand Castings

V-11

BOOKLETS —Starts on page 74

weights, dimensions, and knockout arrangements. Federal specifications are given as they relate to Continental circuit breaker and fusible type panelboards. *Continental Electric Equipment Co., Dept. CE, Box 1055, Cincinnati 1, Ohio.*

VALVES—You can obtain data on valves for a wide variety of applications by using the simplified cross index in 27-page catalog 105. The most widely used cast and forged steel Edward globe and angle stop, non-return, check, gate, hydraulic, relief, mudline, flow-off, and instrument valves and strainers are included. *Edward Valves, Inc., Dept. CE, 1201 W. 145 St., E. Chicago, Ind.*

"HOW TO SELECT AN OVERHEAD CRANE," seven-page Unit 79, is designed to help those who select and specify cranes to analyze handling problems, decide on type of crane desired, and draw up specification sheets for crane proposals. Basic data are provided on classes of crane service, ratings, and capacities, and recommended speeds for bridge, trolley, and hoist, along with standard dimensions and clearances. *Whiting Corp., Dept. CE, Harvey, Ill.*

LIQUID CHILLERS—The wide selection of packaged liquid chillers available from this company for air conditioning and industrial application, sized from 7½ to 150 hp, are presented in 15-page bulletin C-1100-B52. Application photos show the units in operation for chilling waters, brines, and other liquids, and for chilling compressed air. *Worthington Corp., Dept. CE, Harrison, N. J.*

ROOF DRAINS—Prepared to aid in specification and installation of roof drains, 47-page "Zurn Roof Drain Manual," 54-1, includes engineering drawings showing type of drain to use and how to install drains in standard types of roof construction. Drains and recommended drain arrangements for open deck parking areas and outdoor recreation terraces are also shown. *J. A. Zurn Mfg. Co., Dept. CE, Plumbing Div., Erie, Pa.*

COMBUSTION GAS TURBINES for power generation and mechanical drive—their specific applications and construction details—are presented in 28-page bulletin GEA-5516B. Illustrated with photos, diagrams, and sketches, this revised bulletin is a short course in understanding gas turbine operation. *General Electric Co., Dept. CE, Schenectady 5, N. Y.*

"AEROCOR INSULATION," eight-page bulletin GL6.C4 is a complete index to all Aerocor insulations. It lists in

NEW "Small" boiler is a Big Quality package!

Available in sizes 15 through 100 hp — heating or processing steam or hot water. A complete unit from a single source. (Other Cleaver-Brooks boilers in sizes through 500 hp.)

CLEAVER-BROOKS modern C-B boiler

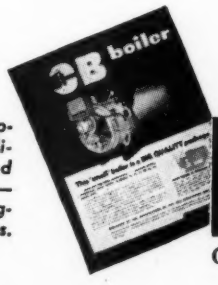
NO BOILER HAS EVER OFFERED SO MANY ADVANTAGES AND QUALITY FEATURES AT SUCH LOW INITIAL COST

• This NEW CB boiler has EVERYTHING needed to bring *big boiler standards* to commercial, industrial and institutional users with small capacity requirements. Despite its unusual, compact size you get big boiler performance — from matched-quality components, proved the world over on thousands of Cleaver-Brooks self-contained units.

Get all the facts NOW on how the new CB can help you save dollars. Make it a point to see . . . and *hear* the most silent-running, biggest boiler value available anywhere!

•

Call your nearest CB boiler representative (see your phone directory) or send for this illustrated catalog describing the NEW CB — designed by Cleaver-Brooks, originators of self-contained boilers.



gives you all the quality features of time-tested self-contained design

- **FOUR-PASS FIRETUBE CONSTRUCTION** — longer gas travel scrubs heat from flame — means lower fuel costs — guaranteed efficiency of 80% when firing with oil.
- **SILENT OPERATION** — even at peak load this boiler more than meets the low sound levels required for schools, hospitals, institutions.
- **FULL FIVE SQUARE FEET** — of heating surface per boiler hp — for longer service life and low maintenance.
- **FUEL FLEXIBILITY** — burns available light oil, gas, or combination oil/gas — simple, quick fuel changeover on oil/gas models.
- **FAST, EASY MAINTENANCE** — front and rear doors hinged for fast inspection, cleaning or servicing boiler.
- **AUTOMATIC SAFE OPERATION** — all controls centralized and conveniently located — modern electronic combustion control is standard equipment.
- **COOLER BOILER ROOM** — fiber glass blanket insulation and 16 gauge metal sectional lagging are non-corrosive, moisture and heat resistant.
- **FULLY APPROVED** — by Underwriter Laboratories; conforms to ASME codes; factory tested before shipment.

NOW—first sizes of the CB boiler are made in Canada, too.

Cleaver Brooks

Cleaver-Brooks Company, Dept. A-321 E. Keefe Ave., Milwaukee 12, Wisconsin, U.S.A.
Cable Address: CLEBRO — Milwaukee — All Codes.

Originators of the Self-Contained Boiler

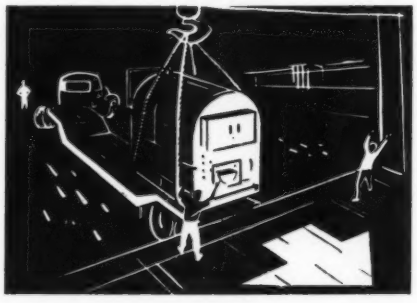
BOOKLETS —*Starts on page 74*

tabular form each type along with its suggested uses, application methods, sizes, and performance. *Owens-Corning Fiberglas Corp., Dept. CE, Toledo 1, Ohio.*

STEAM AND AIR JET SYPHONS — their application, construction, operation, and performance — are described in 23-page bulletin 2-A. Tables on suction capacities, steam consumption, and operation pressures along with flow diagrams and cross sections make this a good piece of reference literature. *Schutte and Koerting Co., Dept. J-O CE, Cornwells Heights, Bucks County, Pa.*

"B&W SEAMLESS OR WELDED STAINLESS MECHANICAL TUBING," six-page folder TB365, outlines advantages offered to design and fabrication engineers who consider tubing in the production of parts and products. In addition to defining finishes, size ranges, types, and shapes of stainless tubing available to industry, folder contains a table of condensed properties and processing data for nine popular grades of stainless tubular products. *Tubular Products Div., Babcock & Wilcox Co., Dept. CE, Beaver Falls, Pa.*

"FOR MORE REASONS THAN ONE THEY ALL PICKED FOAMGLAS," seven-page booklet FG-101, shows how this material has been used to insulate buildings, tanks and equipment, piping, and cold storage spaces. Physical properties of Foamglas are listed. *Pittsburgh Corning Corp., Dept. CE, 1 Gateway Center, Pittsburgh 22, Pa.*



WATER TUBE PACKAGE BOILERS, known as the Compak line, are described in seven-page booklet 5000. Design and construction features are shown in a cut-away drawing with a list of standard equipment, optional equipment, and a graph of performance curves. *The International Boiler Works Co., Dept. CE, East Stroudsburg, Pa.*

SMOKE CONTROL—Ess "Electric Eye" smoke and combustion instruments for detection and control of smoke and haze are described in eight-page bulletin 532. Two types of recorders for keeping records of smoke or combustion haze densities are shown along with indicators and controls for monitoring or controlling fuel-air ratio for best efficiency. *Ess Instrument Co., Dept. CE, 96 S. Washington Ave., Bergenfield, N. J.*

"INSTALL UNDERFLOOR HEATING SYSTEMS AT 25 PERCENT SAVING . . . ," four-page folder, tells how Ceramiduct, a clay product for perimeter and radial underfloor slab heating duct systems, can save you money. Typical installations are shown with cross section diagrams and photographs. *Straitsville Brick Co., Dept. CE, New Straitsville, Ohio.*

"STEEL OILITE," four-page folder, gives complete data on the new sintered material of this name. The bulletin points out that precision finished machine parts can be made from Steel Oilite with over 10 percent ductility and greater impact resistance and fatigue strength. Physical properties and savings possible with use of material are listed. *Amplex Div., Chrysler Corp., Dept. CE, P. O. Box 2718, Detroit 31, Mich.*

2 New Neff & Fry Storage Bins

These 30′ x 67′6″ Neff & Fry Bins were recently erected at the Sandersville, Ga., plant of The Thiele Kaolin Company for handling and storing spray-dried coating clays.

This is an example of the thousands of bins we have built to handle more than 80 kinds of flowable bulk materials—principally ashes, cement, clay, coal, grain, gravel, lime, limestone, ore, sand, and wood chips.

Our bins have many advantages which are explained in our interesting folder entitled, "Bins With the Strength of Pillars." A copy is yours for the asking. No representative will call except by invitation.

Request the folder now while it's on your mind.

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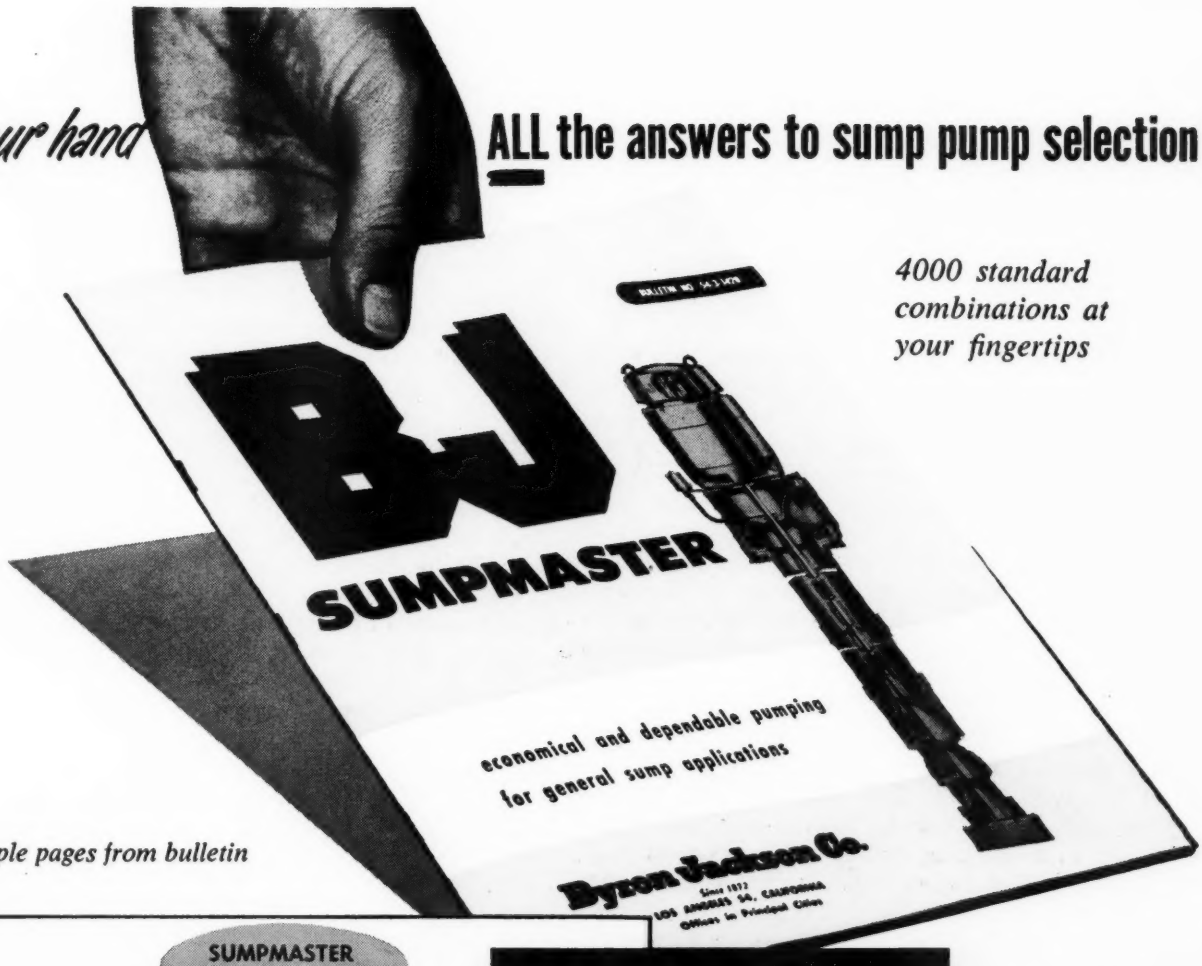

4000 standard combinations at your fingertips

Sample pages from bulletin

SUMPMASTER SELECTION TABLE

GPM	*CODE NUMBER AND HORSEPOWER — TOTAL HEAD IN FEET	20	25	30	40	50	60	70	80	90	100
350	CODE NO.		5126—3 HP	5127—5 HP	5128—7½ HP	5129—7½ HP	5130—7½ HP	5131—10 HP	5132—10 HP	5133—10 HP	50 15
400	CODE NO.	5134—3 HP	5135—3 HP	5136—5 HP	5137—7½ HP	5138—7½ HP	5139—7½ HP	5140—10 HP	5141—10 HP	5016—15 HP	50 15
450	CODE NO.	5142—3 HP	5143—5 HP	5144—5 HP	5145—7½ HP	5146—7½ HP	5147—10 HP	5148—10 HP	5030—15 HP	5031—15 HP	50 15
500	CODE NO.	5149—5 HP	5150—5 HP	5151—7½ HP	5152—7½ HP	5153—7½ HP	5154—10 HP	5044—15 HP	5045—15 HP	5046—15 HP	5047—20 HP	5048—20 HP	5049—20 HP	5050—20 HP

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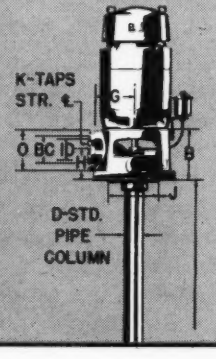
Code Numbers 5073 to 5146



CODE NO.	A	B	C	D	E	F	G	H	J	K
5123-S	9'- 5"	12½	12	5	15⅝	12	8	6¾	10	8¾
5124-S	9'- 5"	12½	12	5	15⅝	12	8	6¾	10	8¾
5125-S	9'- 5"	12½	12	5	15⅝	12	8	6¾	10	8¾
5126-S	8'- 1"	12½	12	5	15⅝	12	8	6¾	10	8¾
5127-S	8'- 1"	12½	12	5	15⅝	12	8	6¾		
5128-S	7'-10"	12½	12	5	15⅝	12	8	6¾		
5129-S	8'- 5⅜"	12½	12	5	15⅝	12	8	6¾		
5130-S	8'- 5⅜"	12½	12	5	15⅝	12	8	6¾		
5131-S	8'- 5⅜"	12½	12	5	15⅝	12	8	6¾		
5132-S	9'- 1½"	12½	12	5	15⅝	12	8	6¾		
5133-S	9'- 1½"	12½	12	5	15⅝	12	8	6¾		
5134-S	7'-11"	12½	10	6	15⅝	12	8	6¾		
5135-S	7'-11"	12½	10	6	15⅝	12	8	6¾		
5136-S	7'-11"	12½	10	6	15⅝	12	8	6¾		
5137-S	7'-11"	12½	10	6	15⅝	12	8	6¾		

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. . . a careful condensation of available information concerning new products.

NEW PRODUCTS that help the engineer who must travel or take work home are always welcome news. For this engineer Mohawk Business Machine Corp., offers the Midgetape, a battery operated, pocket size tape recorder weighing only 3¼ lb. Cartridge loaded, the recorder has only three controls, records for one hour on dual track tape, and simultaneously erases old material as new recordings are made. Wristwatch microphones, a shoulder holster carrying case, and two-way telephone recording adapters are available for use with the recorder. The recording cartridge is mailable.

With the new Universal Desk-Topper drafting and layout machine the same engineer has, at his finger tips, a drafting room wherever a desk, table, or work bench is handy. The unit includes a drafting machine, folding board, drawing tools, and paper dispenser in a carrying carton or in a custom built traveling case (at extra cost). The board accommodates drawings up to 17 x 22 in. According to Universal Drafting Machine Corp., the machine has all the features of a full-size unit.

Also in its own carrying case is a "push button" ruling pen, the Rule-O-Matic, that uses an ink cartridge holding the equivalent of 55,000 in. of ruled lines. Pressing the cap releases enough India ink to fill the stainless steel nib — no inkwell or wiping cloth is necessary. The pen, with two cartridges, is marketed by Rule-O-Matic Corp. in a "snap-shut" case.

In the Office

For office use where many blueprints and drawings must be filed for easy reference, the Fort Pitt Fixture Co. has designed the Martin Sheet File System which mounts on any wall. Construction of the file is simple: a steel tube frame is hinged to a plywood mounting panel with locking hinge support arms. The sheets are hung vertically from spring clips on horizontal bars.

Greater opacity for engineering drawings on vellum, necessary for quality reproductions when using Bruning, Ozalid, and similar processes, is possible with use of a full-coated, single-use tracing carbon. Yellow on one side and black on the other, the paper is placed yellow side up between the original and copy paper. One tracing operation produces an opaque drawing on the vellum and a duplicate copy in black for filing purposes. Paper is made by Columbia Ribbon & Carbon Mfg. Co.

Operating on a principle similar to that used by the self-developing camera, the new Hecco-kwik *(who thinks up these names)* reproduction machine for office use produces dry copies of any typed, printed, written, or drawn material. By use of the exposure dial, the unit can be adjusted to copy material of different densities and degrees of opaqueness on one or both sides of a two-sided original. Hunter Photo Copyist, Inc. say they will be glad to furnish additional information.

Professional looking statistical charts can be made inexpensively and quickly with Picto-Paks, *(same man, no doubt)* symbols printed on sheets of pressure-sensitive paper. Each sheet has symbols — such as men, houses, or machinery — in three sizes, 1¼, ¾, and ½ in. high, black on white and reverse. Chart-Pak, Inc. claims that the pictographs will stick to plastic sheets, cloth, or paper.

Plastic scale models for use in developing new office or plant layouts are available from Visual Production Planning, Inc. at prices that make the scale model technique practical for the smaller engineering office. The company is equipped to supply models of standard machine tools, plant equipment, and office equipment such as desks, files, lockers, and washroom and laboratory facilities. Units are priced from 10¢ to $1.25 each.

In the Field

The 12 in. Conversion Slide Rule, designed by Pickett & Eckel, Inc., makes reference to tables of equivalents unnecessary. The rule has 64 linear, liquid, energy, and miscellaneous factors on one side and a complete trig scale on the other side. By positioning a conversion mark opposite an index mark, any conversion is automatically set and read on the C, D, CF, or DF scale.

Another instrument designed for ease of handling and portability is the Cowley Compactic automatic level. The level employs no cross hairs, bubbles, or leveling screws but operates on an optical principle. The camera-sized unit is placed on the pivot pin of the tripod or wall-top stand and rotated to include the target in the field of vision. A mirror system provides two images of the horizontal target. The target is raised or lowered until the two halves of the image meet. A pendulum suspended inside the housing automatically compensates for tilt of the instrument so that no adjustment is necessary.

For field use, a camera must be rugged and equipped with accessories to meet a wide range of light and distance requirements. Graflex, Inc. has redesigned its Pacemaker 4 x 5 Speed Graphic to include a universal rangefinder that accomodates interchangeable lenses. Individual coupling cams for each lens are quickly attached without tools and fit snugly against the lens boards when not in use. Mounted on top of the camera, the rangefinder contains a built-in Rangelite for focusing after dark. It throws two small spots of light which converge when the camera is focused. Masking accessories for telephoto lenses and a viewfinder lens for wide angle lenses are available. According to Graflex engineers, the equipment is unaffected by a force of 15 G's and temperature changes from –25 to 165 F *(wonder what happens to the cameraman).* ▲▲

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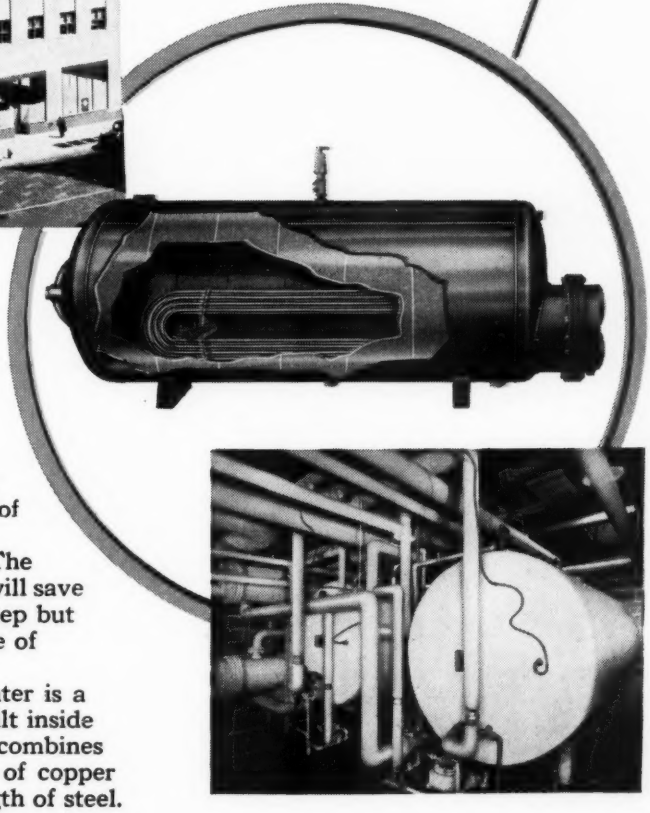
look for the Copper Lining

they did at DUN and BRADSTREET



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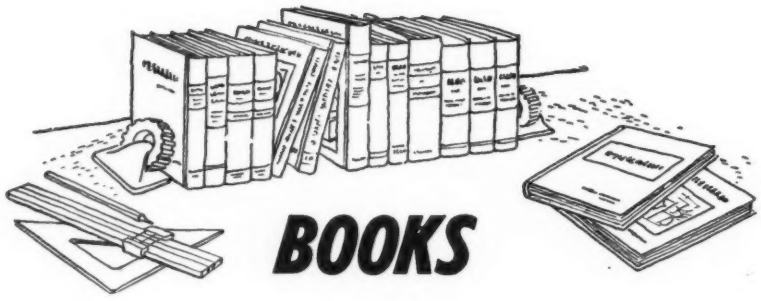

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PROFESSIONAL ENGINEERING — ECONOMICS AND PRACTICE, by S. S. Aidlin; Pelex Publishers; plastic bound; $3.50.

Reviewed by Abraham Slavin
Consulting Engineer and Architect

This book covers material presented as part of a review course for one portion of the New York State Professional Engineer license examinations. It is essentially a compilation of the solutions to problems from prior examinations. No statement is included to indicate verification of the problem solutions. To completely understand the topics and to develop a working knowledge of the subjects covered, it is recommended that this book be used in conjunction with standard texts to gain a complete understanding of the problem solutions.

The inclusion of a general and detailed index would greatly facilitate ready use of the book. Additional steps developing solutions to the problems in engineering economics would make for a better understanding of the included data and would insure its proper use. Reference to tables on interest at the end of the book without properly titling such tables is insufficient. It requires the reader to differentiate between the various headings usually assigned to tables of interest factors.

The parts of the book covering professional engineering in relation to ethics and general practice, exclusive of solving problems in engineering economics, is good although brief. The inclusion of the forms of agreement for engineering work, which are of more value than most young engineers realize, is laudable.

Except as noted above, the effectiveness and order of presentation of the topics are good. While the graphs are excellent, a few more to indicate the economic point in considering comparable schemes would enhance the presentation.

This book is recommended for the use of engineers, young and old, in all fields of engineering practice. But it should be used with accepted texts in preparation for examination. It is also recommended as a reference book for the office library of consulting engineering offices.

•

ATOMIC AND FREE RADICAL REACTIONS (second edition) by E. W. R. Steacie; Reinhold Publishing Corp.; 901 pp, in two volumes; $28.00 for the two volumes.

Reviewed by Norman M. Wiederhorn
Arthur D. Little, Inc.

This edition, appearing but eight years after the first, is an extremely worthwhile addition to the chemical literature. The contents, including literature references up through the latter part of 1953, are completely up-to-date. The thoroughness with which Dr. Steacie reviewed the literature is indicated by the facts that more than two thousand references are cited, and that approximately one thousand reactions are discussed. It is particularly pleasing that the author does not merely present abstracts but attempts to correlate the literature. Furthermore, Dr. Steacie frequently provides his own evaluation of the work cited.

After a short introductory chapter, the first portion of the book (Chapters II to VI) is concerned primarily with a discussion of experimental methods and principles. The second part (Chapters VII to XV) discusses specific reactions. A chapter is devoted to systems containing carbon

and hydrogen only. This is then followed by a series of chapters devoted to systems containing oxygen, nitrogen, chlorine, bromine, iodine, sodium, other metals, and sulfur.

The emphasis in this edition, as in the first, is on thermal and photochemical reactions in the gaseous phase. The discussion of free radical reactions leading to high polymers is meager and only incidental. However, the general concepts that are presented and discussed undoubtedly will be of value to those engaged in this field.

The over-all impression is that this edition is an exceedingly fine piece of work, and well might grace the reference shelves of any organic, petroleum, or polymer chemist. It will be a definite asset for anyone concerned with the study of chemical kinetics. It is not a textbook. Because of the lack of an elementary discussion of kinetics, its use by those not familiar with the basic concepts will be limited.

•

PRINCIPLES OF ENGINEERING THERMODYNAMICS by Paul J. Kiefer and Gilbert Ford Kinney; John Wiley and Sons, Inc.; 539 pages; $7.75.

This classic text details the capabilities, limitations, and other basic data required in the design and operation of power machines. The authors are chiefly concerned with the practical outcome that can be derived by the engineer. They discuss convenient engineering methods for coordinating the thermodynamic properties of higher-pressure gases; they show the influences of chemical equilibrium in combustion processes; they go into modern techniques for thermodynamic analyses of high-velocity flow phenomena with compressible fluids in nozzle, diffuser, or duct; and they supplement the familiar steady-flow energy equation by a parallel dynamics approach.

•

APPLIED ELECTRONICS, Second Edition by Truman S. Gray; John Wiley & Sons; 881 pages; $9.00.

This edition has received careful scrutiny from start to finish with a view to clarifying details and including the latest developments. With the great promise now shown by transistors, Dr. Gray has found it logical to give them equal emphasis with electron tubes. An entirely new chapter now covers semiconductor rectifiers and transistors, describes their physical behavior and characteristics, and their applications in circuits. Among the many additions to the book are treatments of magnetic deflection of cathode-ray oscillographs, the excitron and capacitron, resistance capacitance and negative-transconductance oscillators, intermodulation, mixers, and frequency converters.

ALSO AVAILABLE

CONSTANTS FOR DESIGN OF CONTINUOUS GIRDERS WITH ABRUPT CHANGES IN MOMENTS OF INERTIA by R. A. Gaughey and R. S. Cebula; Iowa State College; 30 pages; no charge.

This is a bulletin of the Iowa Engineering Experiment Station. It presents stiffness factors, carryover factors, and fixed-end moments in handy form. Special tables and charts are included. They would be of particular value to the designer of concrete highway bridges, though they do not supply the needs of designers working with rolled steel sections. This bulletin contains a review of the literature plus extensive references.

•

PAST EXAMINATIONS FOR PROFESSIONAL ENGINEER, NEW YORK STATE; John D. Constance; set of stapled sheets; $1.50.

This is a compilation of past examinations. It covers structural planning and design, practical application of the basic engineering sciences, and engineering economics and practice. Although the problems presented are taken from past examinations of New York State only, the coverage is so comprehensive that the booklet is being used throughout the country in preparation for the examinations of many states in the country.

•

THE SKILLED LABOR FORCE: Technical Bulletin No. T-140; United States Department of Labor; 52 pp; 45¢.

This booklet was prepared by the Bureau of Apprenticeship, and is based on Census Bureau data covering the past 50 years. Included is information concerning the distribution of craftsmen by industry, trade, and locality; their ages and educational background; their income and status; the numerical relationship of craftsmen to the population; and trends in the growth of the various crafts. This information would be invaluable to a consultant selecting an industrial plant site for a client.

•

THE AUTOMATIC OFFICE; John C. Windsor, Jr., et al; Alden Systems Company; 48 pp; $5.00.

This volume is composed of reports, made to the Harvard Graduate School of Business Administration, on the application of electronic digital computer principles to the automization of clerical and accounting routines. It is a nontechnical report showing how the office will change in the next 25 years.

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